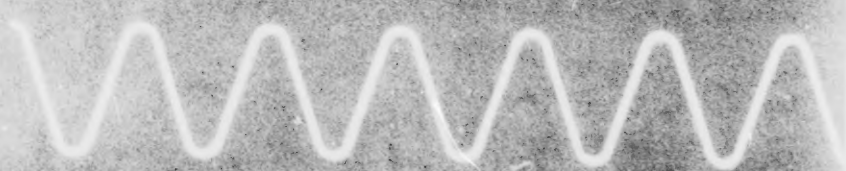
Ontario Communications Handbook

1985



Ontario Communications Handbook

1985

Ontario

Ministry of Transportation and Communications

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PREFACE

The first edition of Ontario's Communications Handbook was published in response to the many inquiries which the ministry receives about communications services, facilities and issues in Ontario. These requests have come largely from consumers, students, companies and potential investors or enterpreneurs.

The purpose of the handbook is to provide a comprehensive overview of broadcast and telecommunications services, facilities, industries and regulation in the province. While it duplicates many other scattered sources of information, it is, to our knowledge, the first really comprehensive source or reference book of its kind. An updating of the handbook every two years is planned.

Your comments and questions are welcomed.

April, 1985

ACKNOWLEDGEMENTS

This handbook was developed by a group of staff and summer staff in the communications division of the ministry, namely: Wayne McEachern, Bruce Meyrick, Kathy Clarke and Niki Gallo. The ministry would like to thank the many individuals in the communications industries who offered advice and contributed to the handbook.

TABLE OF CONTENTS

SECTION	PAGE NO.
PREFACE	
ACKNOWLEDGEMENTS	
A. INTRODUCTION	1
B. MOVING INFORMATION	
1. GENERAL	4
2. ENERGY WAVES	4
3. COMMUNICATIONS SYSTEMS	6
C. VOICE TELEPHONY	
1. GENERAL	8
2. INDUSTRY STRUCTURE	9
3. REGULATORY STRUCTURE	10
4. NETWORK SERVICES	12
i. INDIVIDUAL LINE SERVICE	12
ii. PARTY-LINE SERVICE	13
iii. MESSAGE TOLL SERVICE	13
iv. MESSAGE TOLL CONFERENCE SERVICES	13
v. OVERSEAS SERVICE	14
5. SPECIAL SERVING ARRANGEMENTS/ FACILITIES	
i. WIDE AREA TELEPHONE SERVICE	14
ii. EXCHANGE RADIO TELEPHONE	14

SERVICE
iii. PRIVATE BRANCH EXCHANGE SERVICE 15
iv. FIGURE 1 – TYPICAL PBX CONFIGURATION 17
v. PUBLIC (COIN) SERVICE 16

6. SOURCES OF FURTHER INFORMATION 18

D. MESSAGE, TEXT AND DATA TRANSMISSION

1. GENERAL 20
i. TELEGRAPH SERVICES 20
ii. ELECTRONIC MAIL SERVICES 20
iii. CIRCUIT-SWITCHED SERVICES 20
iv. PACKET-SWITCHED SERVICES 21

2. INDUSTRY STRUCTURE 22

3. REGULATORY STRUCTURE 23

4. NETWORK SERVICES 24
i. TELEGRAPH SERVICES
a) Telex 24
b) DataTelex 25
c) Teletypewriter Exchange Service TWX 25
ii. ELECTRONIC MAIL SERVICES
a) Envoy 100 26
iii) MESSAGE-SWITCHED SERVICES
a) Autocom II 27
b) Telenet 28
iv)CIRCUIT-SWITCHED SERVICES
a) Broadband Exchange Service 29
b) International Datel 600 30
c) Multicom 1 30
d) Multicom 2 31
e) Datalink 32
f) Infoswitch – Infoexchange 33

v. PACKET-SWITCHED SERVICES
a) Datapac 34
b) Infoswitch-Infocall 35
c) Infoswitch-Infogram 39
vi. DATABASE ACCESS SERVICES
a) iNET 40
vii. SPECIAL SERVING ARRANGEMENTS/ FACILITIES
a) Dataroute 41
b) Infodat 42
c) Private (Leased) Services 43
d) Voicegrade Channels 45
e) Stratoroute 2000 45

5. SOURCES OF FURTHER INFORMATION 47

E. RADIO NON-BROADCAST

1. MOBILE VOICE AND PAGING SERVICES 49
i. GENERAL
a) Paging Services 49
b) Mobile Radio Services 50
c) Cellular Radio Services 50
Fig. 2 – Cell Configuration for Cellular Mobile Radio 51
ii. INDUSTRY STRUCTURE 52
iii. REGULATORY STRUCTURE 52

2. GENERAL RADIO SERVICE (CB RADIO) 53
i. GENERAL 53
ii. REGULATORY STRUCTURE 53

3. SOURCES OF FURTHER INFORMATION 54

F. BROADCASTING

1. RADIO 56
i. GENERAL 56
ii. INDUSTRY STRUCTURE 58
iii. REGULATORY STRUCTURE 58

2. TELEVISION 60
i. OVER-AIR 60
a. General 60
b. Industry Structure 61
c. Regulatory Structure 62
ii. CABLE TELEVISION 63
a. General 63
b. Industry Structure 65
c. Regulatory Structure 65

3. SOURCES OF FURTHER INFORMATION 67

G. SATELLITE

1. GENERAL 69
FIGURE 3 – TYPICAL USES OF A COMMUNICATIONS SATELLITE 70
FIGURE 4 – DIRECT BROADCAST SATELLITE SYSTEM 72

2. INDUSTRY STRUCTURE 71

3. REGULATORY STRUCTURE 73

4. SOURCES OF FURTHER INFORMATION 74

H. VIDEOTEX

1. GENERAL 75

2. INDUSTRY STRUCTURE 76

3. REGULATORY STRUCTURE 77

4. VIDEOTEX SERVICES 77
i. TELEGUIDE 77
ii. GRASSROOTS 77
iii. TABS 78
iv. VET-TEL 79
v. MARKETFAX 79
vi. EDUTEX 79
vii. EDUTEL 80
viii. BN INFOVISION 80
ix. INFONORTH 80

5. SOURCES OF FURTHER INFORMATION 82

APPENDICES

i. RADIO STATIONS 83
ii. TELEVISION STATIONS 107
iii. CABLE TELEVISION COMPANIES 113
iv. INDEPENDENT TELEPHONE COMPANIES 127
v. GLOSSARY 134

A. INTRODUCTION

A. INTRODUCTION

Communication may be defined as the transfer of information from one place to another. Prior to the mid-18th century the only way to transfer information to someone (or some place) out of the sight and hearing of the sender was to carry it in the head or hand of a messenger. This meant that information could move only as fast as could man. Communications might take days, weeks, or even months, depending on the distance between sender and destination, and whether the messenger travelled by foot, horseback, boat or train.

Today, in what has been called the Information Age, we push a few buttons and talk to someone thousands of miles away, news events are flashed onto television screens around the world as they happen, and computers "talk" to each other quickly, exchanging large quantities of information.

The flow of information is an integral part of modern industrial society, and Ontarians are served by some of the most advanced information systems in the world.

B. MOVING INFORMATION

B. MOVING INFORMATION

1. GENERAL

There are two fundamental ways to move information: by imprinting it on a material object, and moving the object; or by transforming it into energy, and moving the energy. An example of the former method is the writing and mailing of a letter. When someone reads the letter the second mode of transmission comes into play. The reader's eye senses the words in the form of light energy, and they are recreated in visual form by the brain. If the letter is read aloud, the words will reach the ears of a listener in the form of sound energy.

The development of modern communications technology began with Samuel Morse's invention of the first telegraphy system in 1837. The basis of this system, and of all subsequent communications systems, is energy. Information is moved by transforming it into electrical energy, which can be transmitted along a wire or cable, or electromagnetic energy, which moves through the atmosphere and space without any physical guide.

2. ENERGY WAVES

Sound energy, light energy, electrical energy, electromagnetic energy - each has its own characteristics, but all share one fundamental trait, wave motion.

A wave is a "disturbance" travelling through a medium. The disturbance is caused by energy acting on the particles of the medium. It is initiated by the introduction of energy to the medium (for example, by dropping a stone into water), and it "moves" as the energy is transmitted to successive particles. Successive injections of energy create a continuous series of waves.

The rate at which the wave-form repeats itself is the wave frequency. It is measured in cycles per second, or Hertz (Hz). The wave amplitude is a measure of the amount of energy involved in the disturbance.

Sound energy consists of energy waves moving in air, causing the air particles to vibrate with consequent variations in air pressure. This, in turn, causes a membrane in the ear to vibrate, producing the sensation we know as sound. The higher the frequency of the sound-wave, the higher the pitch of the sound we hear. The greater the amplitude of the wave, the louder the sound. A sensitive human ear can detect sound waves varying in frequency from less than 2 KHz to 20 KHz.

The speed of sound waves vary with the medium (gas, solid, liquid) in which they are travelling, but in air it is about 332 metres per second. As the sound-wave moves forward, some of its energy dissipates until eventually its amplitude is so small that the sound is inaudible.

Electrical energy-waves consist of charged particles moving through a medium at varying rates or current. Higher frequencies correspond to more rapid oscillations in current. The amplitude of the wave corresponds to the maximum amount of charge (voltage), or the strength of the current that is moving through the medium. Electrical current moves at speeds approaching the speed of light (i.e. 300,000,000 m/s). Just as a sound wave loses energy and fades, so does an electrical current lose voltage, the rate of loss being dependent on the medium in which the current is moving. Electrical current is transmitted along wires or cables. These are designed to handle various amplitudes and frequencies depending on the distance the current must be carried and the uses to which it will be put.

Electromagnetic energy-waves consist of "fields" radiated from charged particles undergoing acceleration (i.e. electrical current) in a transmitting antenna. The fields themselves do not involve any particles (they are capable of moving through free space) but they change the properties of the space in which they move in a way that can be sensed by detectors of electricity and magnetism. Electromagnetic waves have frequencies ranging from less than 1 Hz to over 3 GHz, and all travel at 300,000,000 metres per second, the speed of light. The entire range of EM frequencies

is known as the Electromagnetic Spectrum which can be roughly subdivided into bands of frequencies having similar characteristics and uses.

The transmission characteristics of EM waves vary with frequency. Generally, the higher the frequency the straighter the path of the wave, and the more easily it is obstructed.

3. COMMUNICATIONS SYSTEMS

Currently, communications systems utilize wires or cable, radio, microwave, optical fibre technology and satellites in order to relay voice, video and data information in Ontario.

C. VOICE TELEPHONY

C. VOICE TELEPHONY

1. GENERAL

Voice telephony refers to a type of electronic communication service with which everyone is familiar, telephone service, or in technical terms, the transmission of voice messages between customers using telephone terminals.

The telephone set is the user's terminal equipment. Its principal function is to convert sound waves to electronic signals and vice versa. The telephone set also sends addressing signals to the telephone exchange, identifying the called set. Every telephone is identified by a seven-digit number. The first three identify the local exchange with which the telephone is associated, while the last four identify the telephone set itself.

Telephone sets are connected to the local exchange by a local loop - usually a 2-wire line dedicated to the particular set. The area served by the local exchange area is the local service area. Local service is generally billed on a monthly, flat-rate basis in Canada. Some local service areas contain several exchanges. The local exchange is the switching centre for the telephones that are connected to it.

When a call is placed between two telephone sets in the same exchange, the switching equipment connects the two local loops, whereas, if a call is placed to a telephone that is served by a different local exchange in the same local service area (e.g. from 234-xxxx) the signal is transmitted between exchanges via an interoffice trunk facility.

Long distance calls, which are calls placed between telephones in different local calling areas, are switched through Toll Offices. The local exchange office recognizes these calls by the digit 1 (or 0 if operator

assistance is required) at the start of the dialled telephone number, and routes them along toll trunk facilities from the local exchange to the nearest toll office. The toll office then makes a connection through an intertoll trunk facility with the toll office that serves the called telephone (identified by the 3 digit Area Code). Intertoll trunks may consist of wires/cable, microwave relays, optical fibres or satellite systems. The second toll office then makes the same connections, in reverse, to the called telephone.

2. INDUSTRY STRUCTURE

Telephone service in Ontario is provided by 32 telephone companies, each operating on a monopoly basis within its designated territory. The largest territory, comprising most of southern and northwestern Ontario, is served by Bell Canada, a federally incorporated company that is owned by Bell Canada Enterprises and regulated by the Canadian Radio-Television and Telecommunications Commission (CRTC). Bell Canada is a member company of Telecom Canada, an organization embodying the nine major Canadian telephone companies and Telesat Canada. Telecom Canada coordinates the operations of its member companies to provide a fully-integrated coast-to-coast network for the transmission of voice, data and image communications.

Long distance telephone service in North Eastern Ontario, within a territory that borders the western side of James Bay, is provided by Ontario Northland Telecommunications. This is a division of the Ontario Northern Transportation Commission, a self-regulating provincial crown agency.

The other 30 telephone companies are 'independents', and most serve smaller territories composed of less than five exchanges. The largest is Northern Telephone Limited, a subsidiary of Bell Canada, which has 32 exchanges. The independent telephone systems include privately owned incorporated companies, systems operated as public utilities by municipal corporations and subscriber-owned municipal systems.

International Services

International services outside continental North America are provided through the facilities of Teleglobe Canada and Telesat. Those in Canada and the United Strates are dominated by A.T. & T.

Teleglobe Canada

Teleglobe Canada is a federal crown corporation which provides the facilities and arrangements for overseas telecommunications. (Telcommunications between Canada and the United States are accommodated by arrangements between the Canadian and American carriers). Teleglobe's 'international gateway' facilities are located in Vancouver, Toronto and Montreal.

Telesat Canada

Telesat Canada is an incoporated company that is jointly owned by the federal government and the telecommunications carriers. Telesat provides domestic satellite service. Telesat facilities are interconnected with the terrestrial facilities of the carriers, who lease channels from Telesat for the transmission of voice, data, and broadcast signals. (see also Section G, Satellite Services).

3. REGULATORY STRUCTURE

Federally incorporated telecommunications carriers such as Bell Canada and Telesat are regulated by the Canadian Radio-Television and Telecommunications Commission (CRTC). The CRTC has the authority to approve the terms and conditions (including rates) on which service is offered, any changes in those terms and conditions, any agreements entered into, and stock issues. Bell is further required to give notice of any proposed charges (e.g. rate increases), to subscribers and other interested parties. The Commission itself may issue public notices and invite comment with regard to other telecommunications issues. Subscribers and potential subscribers of Bell Canada may also make applications to the CRTC. The procedures followed by the CRTC and required of applicants are detailed in the CRTC Telecommunications Rules of Procedure.

The independent telephone companies in Ontario are regulated pursuant to the Telephone Act R.S.O. 1983, Chapter 71 by the Ontario Telephone Service Commission (OTSC), a provincial government agency. The OTSC's powers are similar to those of the CRTC. Section 6 of the Act enpowers the OTSC to hear and decide applications brought before it under the Act or regulations and in particular, to make orders:

(a) setting out the terms and conditions to be in contracts between any class of telephone system and affiliated persons, and between any class of telephone system and other person offering telephone services;

(b) governing the nature and quality of any class of telephone services;

(c) concerning installation of and maintenance and access to telephone facilities;

(d) concerning accounts issued by any class of telephone system;

(e) regulating and controlling business procedures of any class of telephone system including:

i. accounting methods;

ii. costing methods, and;

iii. reporting of financial, construction and investment plans.

(f) requiring the provision of any class of telephone service to applicants therefore and setting out the terms thereof.

S.26 of the Act enpowers the Lieutenant Governor in Council to make regulations:

(a) prescribing classes of telephone systems and classes of telephone services;

(b) prescribing terms and conditions and rules applicable to any class of telephone system and customers in respect of classes of telephone services;

(c) exempting any class of telephone system from the application of any section of this Act and prescribing conditions for the exemption;

(d) exempting any class of telephone service from any section of this act and prescribing conditions for exemptions.

Teleglobe Canada is a self-regulated agency of the federal government which answers to the Minister of Communications.

4. NETWORK SERVICES

The network services that are available from most telephone companies in Ontario are as follows:

i) Individual Line Service

Individual line service is provided by all telephone companies. Individual line service provides for the connection of a single main telephone (which may be associated with one or more extension telephones) to a local loop line. This service is available on a flat-rate or message-rate basis. Flat-rate customers pay a fixed monthly charge, regardless of the number of local calls made. Message-rate is available for some business customers only and involves a charge for each call made. Customers located outside of the Base Rate Area of their exchange pay an additional mileage/distance charge.

Individual line local telephone service is accessible by carrier or customer provided telephone sets. The telephone set is connected to the telco local exchange by a 2-wire loop line. Individual line service is available in all local-service areas.

ii) Party-Line Service

Party-line service is provided by all telephone companies. Party-line service provides for the connection of two or more main telephones to the same central-office line. Standard party-line offerings are two-party, four-party, and multi-party lines. Each main telephone is still addressable by its own number, but all telephones share the same line. Party-line service is available in all local service areas.

iii) Message Toll Service

Message toll service is provided by all telephone companies. Message toll service is the basic 'long-distance' telephone service that provides for communication between exchanges or other rate centres. A subscriber making a long-distance call connects with the nearest toll- centre through the facilities provided by exchange (local) service. The connection is made automatically when the caller dials a long-distance number. The toll-centre is connected to toll-centres in other exchanges by trunk lines. The switching equipment at the caller's toll-centre makes the connection with the called party's toll-centre via a trunk line. The connection with the called party is then completed over the exchange (local) service facilities. Long distance calls may be placed by dialling directly (direct distance dialling) or with the assistance of an operator.

Two-point service provides for telephone communication between two points in Canada, the United States and Mexico. Rates are based on the distance between the rate centres of the two points, the duration of the call and time at which it is made.

iv) Message Toll Conference Services:

Message toll conference services provide for the interconnection of three or more main telephones, private branch exchange (PBX) extension telephones, or PBX systems. The interconnection may allow two-way communication between all parties. It may also be arranged so that one party transmits while the others only receive.

The charge for a message toll conference call consists of:

i. the person-to-person message toll rate applicable to each call station beyond the local service area of the originating station;

ii. the local-conference charge applicable to each call station within the local-service area of the originating station;

iii. the conference-service charge based on duration of the call.

v) Overseas Service

Overseas service allows for telephone communication between rate-centres in Canada and points outside Canada, the United States and Mexico. Overseas service is provided through the facilities of Teleglobe Canada. Direct dialling to over 50 overseas countries is available from most places in Canada. Calls may also be placed with operator assistance.

Rates vary according to the country and the type of call. They are based on the time and the duration of a call. In addition, customer-dialled calls are cheaper than operator-assisted calls, while station-to-station calls are cheaper than person-to-person calls.

5. SPECIAL SERVING ARRANGEMENTS/FACILITIES

i) Wide Area Telephone Service (WATS)

Wide area telephone service is carried by all telephone companies. WATS is a long-distance calling arrangement for customers with heavy long-distance traffic. The WATS customer is entitled either to 160 hour blocks or 10 hour blocks of use on the WATS line each month. Usage in excess of the block purchase is provided at additional charge in increments of 5 hours (160 hour service) or 1 hour (10 hour service).

There are six WATS zones in Canada. A customer may arrange for WATS access to or from any one or more of the zones. A WATS customer may originate or receive WATS calls to or from any exchange within the specified WATS zones provided that the exchange belongs to a telephone system that offers WATS service.

There are two categories of WATS service: Outward Wide-Area Telephone Service (OUTWATS), and Inward Wide Area Telephone Service (INWATS).

OUTWATS service provides for customer-dialled calls to specified WATS zones whereby the customer is connected to the telco central-office by a WATS access line which permits outgoing calls only.

800 service provides for receiving customer-dialled calls to an 800 service access line from specified WATS zones in Canada without charge to the customer originating the call.

ii) Exchange Radio Telephone Service

Exchange radio telephone service is provided by all telephone companies. Exchange radio telephone service provides local telephone service for customers who live within an exchange area but beyond distribution lines and, therefore, within territory that can only be reasonably served by radio communications. The telco provides the customer with an antenna which receives and transmits voice signals over air to and from the telco exchange-office. The customer is responsible for providing tower and associated equipment at his location, and for installing the antenna according to telco specifications. Exchange radio service is available on an individual or multi-party basis and rates consist of a fixed monthly charge, in addition to an initial service charge.

iii) Private Branch Exchange (PBX) Service:

Private branch exchange service is available via all telephone companies. Private branch exchange service provides the customer with a private switching centre (the PBX) which is usually located on the customer's premises and is connected to the telco central office by a trunk line. The PBX itself may be carrier or customer supplied. There are many models on the market, some which are completely automated and some which require an attendant. Their basic functions, however, are the same in that they make connections between the customers' own telephones, for internal communications, and between the customers' telephones and the telco central-office, via the trunk lines (see Figure 1).

iv) Public (Coin) Service

Public (coin) telephone service consists of the provision of publicly accessible telephones generally for outgoing calls only. It is available only on a message-rate basis whereby telephones are equipped with coin collection devices and a fixed rate is charged for each local call. Appropriate long-distance rates are charged for inter-exchange calls. Public telephones are placed in publicly accessible locations at the discretion of the carrier. Public telephone service is available in all local service areas in Ontario.

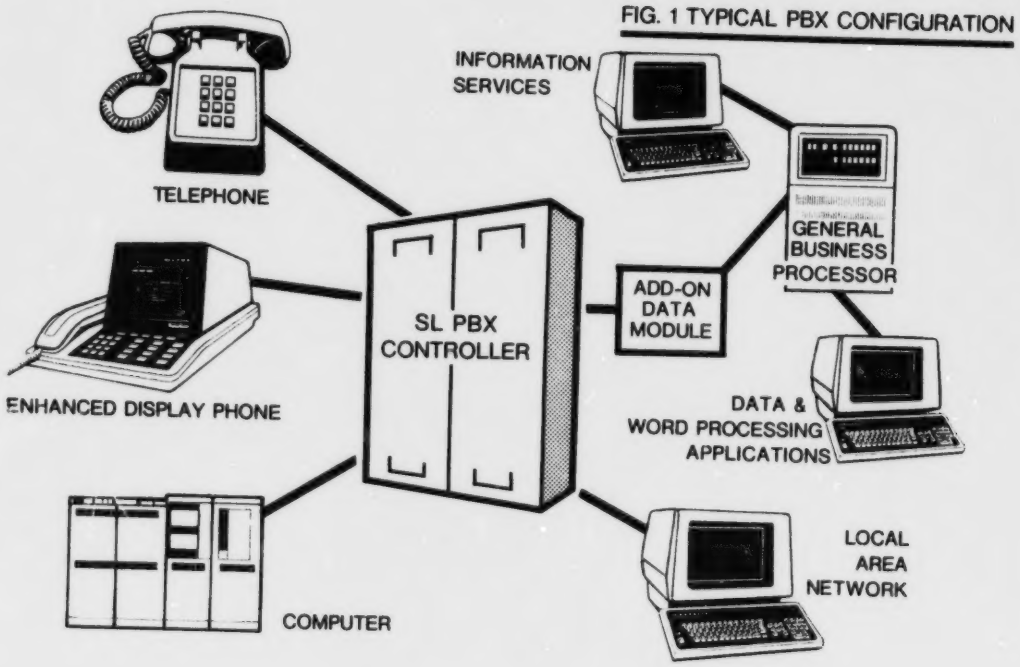


FIG. 1 TYPICAL PBX CONFIGURATION

6. SOURCES OF FURTHER INFORMATION

Bell Canada
Bell Trinity Square
Toronto, Ontario
M5G 2E1

CNCP Telecommunications
3300 Bloor Street West
Toronto, Ontario
M3X 2W9

Information Services
Canadian Radio-Television and
Telecommunications Commission
Ottawa, Ontario
K1A 0N2

Department of Communications
Government of Canada
300 Slater Street
Ottawa, Ontario
K1A 0C8

Independent Telephone Companies
(see Appendix IV)

Communications Division
Ontario Ministry of Transportation &
Communications
1201 Wilson Avenue
Downsview, Ontario
M3M 1J8

D. MESSAGE, TEXT AND DATA TRANSMISSION

D. MESSAGE, TEXT AND DATA TRANSMISSION

1. GENERAL

i) Telegraph Services

Telegraph services provide for the transmission of messages between user-terminals (teletypewriters) by means of a coded electrical signal. The sender types an alphanumeric message into the teletypewriter which converts each character into a series of electrical pulses in accordance with a prescribed code. The resulting digital signal is transmitted along a wire to the receiving terminal, which decodes it and types out the original message. Each terminal is identified by an address, and any subscriber can communicate with any other by dialling the appropriate address. Telegraph systems are generally designed for low-volume use and have relatively low transmission speeds.

ii) Electronic Mail Services

Electronic mail services provide for person-to-person communication of messages using electronic means for entry, transmission and delivery of information. Subscribers to electronic mail services can input a message at their word processors or personal computer and 'address' it to the intended recipient. The message is either transmitted directly to the addressee's terminal, or, if the service has store-and forward capability, it may be stored in a system computer until the addressee requests to see his file of messages.

iii) Circuit-Switched Services

Circuit-switched services establish temporary transmission paths between communicating terminals. Transmission of information from one terminal to another cannot commence until the entire path is established, and then the terminals have exclusive use of the path, for the duration of the call. The users pay for the duration of the connection, even if

they are not actually transmitting data all of that time. Since the terminals are communicating directly with each other, they must operate with the same transmission speed and code.

iv) Packet-Switched Services

Packet-switching systems were developed as a means of achieving greater efficiency in the use of network transmission channels. Instead of assigning whole channels to the temporary exclusive use of two communicating terminals, as in circuit-switched systems, a packet-switched system splits the information-messages received at switching modes from all user-terminals into standard-form "packets".

A packet consists of 2000 to 8000 bits. It includes a "header" which contains information about the message such as length, sequence numbers, billing information and identity of the sending terminal. The packet also includes a destination address identifying the receiving terminal and an error-control sequence.

The packets from many users are combined or interleaved and transmitted on a single, continuous stream through the various network channels to the appropriate destination-nodes. Each node is a computer with control capability. The node can forward packets immediately if the appropriate channel space is available or hold them in a queue if it is not. It can also forward them on an alternate route if heavy traffic or trouble conditions on the most direct path would entail excessive delay. The packets for any one message may be transmitted through the network along several different transmission paths. At the network node that services the destination terminal, the data contained in the packets is reassembled into the correct sequence and transmitted to the receiving terminal.

The system protocol is a set of rules that define how terminals will interact with the network, and in particular, show the format of the packets. Since all transmission must be in the appropriate packet-format, all terminals using the system must be able to implement the system protocol. If the terminal itself does not have this capability, it can interface with the system through a modem that does. Some packet-switching networks can perform the packetization at the network nodes,

so that user terminals need not have the ability to implement protocols. In either case, the transmitting and receiving terminals need not be speed-compatible.

All packet-switched services in Canada use the X.25 protocol. X.25 has been ratified by the International Telegraph and Telephone Consultative Committee as the international standard for packet mode operation.

2. INDUSTRY STRUCTURE

Two major common carriers provide most of the message, text and data communications services in Canada. Telecom Canada is the organization composed of the nine major Canadian telecommunications carriers/telephone companies and Telesat Canada, as previously mentioned. Telecom Canada coordinates the operations of its member companies to provide an integrated coast-to-coast network for the transmission of voice, data and image communications. In Ontario, Telecom Canada services are available through Bell Canada. Telecom Canada has approximately the same share of message, text, and data communications market as CNCP Telecommunications, the other major carrier. The primary function of Telecom Canada member companies is the provision of voice grade telephone services.

CNCP Telecommunications is an incorporated company, jointly owned by Canadian National Telecommunications and Canadian Pacific Telecommunications. It offers message, text and data communications and private-line voice services in competition with Telecom Canada. CNCP has its own transcontinental microwave network but leases local facilities from local telephone companies.

Since 1979 CNCP has been permitted to interconnect its transcontinental network facilities and customer-terminals with Bell Canada's local distribution facilities. This permits customers to have access to CNCP services without the expense of separate local access facilities.

Teleglobe Canada is the self-regulated federal crown corporation which provides the facilities and arrangements for overseas telecommunications. Telecommunications between Canada and the United States are

accommodated by arrangements between the Canadian and American carriers. Teleglobe's 'international gateway' facilities are located in Vancouver, Toronto and Montreal.

Telesat Canada is an incorporated company that is jointly owned by the federal government and the telecommunications carriers. It provides domestic satellite service. The company's facilities are interconnected with the terrestrial facilities of the carriers, who lease channels from Telesat for the transmission of voice, data, and broadcast signals. (see also Section G, Satellite Services).

3. REGULATORY STRUCTURE

Bell Canada, CNCP, and Telesat Canada are all regulated by the Canadian Radio-television and Telecommunications Commission (CRTC), pursuant to s.14 of the CRTC Act, which transfers authority over telecommunications from the Canadian Transport Commission to the CRTC. The role of the CRTC in the regulation of telecommunications is mainly derived from Section 321 (1) and (2) of the Railway Act. This Act requires that tolls of inter-provincial companies be "just and reasonable" and that there be no "unjust discrimination in respect of tolls or any services or facilities provided by the company as a telegraph or telephone company".

Each carrier must apply to the CRTC for approval of its terms and conditions. This includes rates on which service is offered, of any changes in those terms and conditions, of connecting agreements with other carriers and of stock issues. Carriers are required to give notice of any proposed changes, for example, rate increases, to subscribers and other interested parties. The Commission may issue public notices and invite comment with regard to applications where deemed appropriate. Subscribers and potential subscribers of a telecommunications carrier may also make applications to the CRTC. The procedures followed by the CRTC and required of applicants are detailed in the CRTC Telecommunications Rules of Procedure.

4. NETWORK SERVICES

Several types of network services are offered as follows:

i) Telegraph Services

(a) TELEX

TELEX Service is offered by CNCP Telecommunications and Ontario Northland Telecommunications. Telex is a public switched telecommunications service, providing for two-way, non-simultaneous, written word communications between subscribers using teletypewriter terminals. The Telex system operates at a speed of 50 baud, (approximately 67 words per minute) using the 5-bit international (Baudot/Murray) code with a maximum of 59 usable characters.

Telex subscribers can communicate directly with over 50,000 subscribers in Canada through Telex exchanges in Vancouver, Winnipeg, Toronto, and Montreal. They also communicate with 65,000 Telex and 53,000 TWX subscribers in the United States. Overseas connections to 500,000 Telex subscribers in over 180 countries can be made through the Vancouver and Montreal exchanges.

Subscribers access the Telex system through carrier or customer-provided teletypewriter terminals. Carrier-provided line facilities connect terminals to Telex exchanges. Telex service is available to subscribers in or near exchange locations in Ontario. Service is provided to locations remote from Telex exchanges subject to availability of facilities.

Telex Optional Features

Multiple Address Telex Service is a store-and-forward service that allows authorized terminals to send messages to any number of addresses in Canada and the contiguous United States.

Store-and-Forward Telex Service allows subscribers to send single or multiple messages for delivery at a specified time.

Tel-Tex Service allows Telex subscribers to communicate with non-subscribers located within the free telephone calling area of designated Tel-Tex service centres in Canada. There are 20 service centres in Canada. Service centres in Ontario include: Kingston, Kitchener, London, Ottawa, St. Catharines, Thunder Bay, Toronto and Windsor. The United States has 80 service centres. The subscriber dials the carrier's terminal in the appropriate service-centre and the message is forwarded by the carrier to the addressee.

Telepost is a computer inquiry service offered in conjunction with Canada Post which allows Telex subscribers to send a message to any address in Canada that has a postal code. The subscriber dials the Telepost computer and the message is forwarded to a terminal at the appropriate Post Office. It is then delivered to the addressee in the next mail delivery.

b) Datatelex

This service is offered by CNCP Telecommunications and Ontario Northland Telecommunications and may be accessed by carrier or user teletypewriter or data terminal equipment. Datatelex is a switched telecommunications service providing for two-way non-simultaneous data communications, on a closed user group basis. A typical example would connect several user facilities at different locations. It is used for transmitting more complex information at higher speeds than the normal Telex system. The Datatelex system allows subscribers in the same user group to communicate with each other at speeds of up to 180 baud. They can use 5, 6, 7, or 8 bit transmission codes, providing their terminal equipment is speed and code compatible. Datatelex is available only within Canada.

c) Teletypewriter Exchange Service (TWX)

This service is offered by Bell Canada, Ontario Northland Communications, Northern Telephone Limited and Telecom Canada. TWX is a public circuit-switched telecommunications service providing for non-simultaneous written word communications on a two-party or conference basis. The TWX system operates at a speed of 110 baud (100 words per minute) using the 8-bit ASC II code with 128 usable characters.

TWX subscribers can communicate with Western Union TWX and Telex in the United States, and with overseas Telex but not with CNCP Telex Services.

Subscribers access the TWX system through carrier or customer-provided teletypewriter terminals. Carrier-provided line facilities connect the terminals to TWX exchanges.

Monthly network rates consist of an access charge and a usage charge for calls placed based on time and distance.

TWX Optional Features

Alternate Use TWX/Datacom permits use of the same terminal to access both the TWX network and the direct distance dial (DDD) network to reach other compatible business machines. Datacom is a proprietory family of data terminals.

Half/Full Duplex enables the user to transmit and receive on the same terminal simultaneously.

Multiple Address/Multiple Message Service allows TWX subscribers to send on one connection, one or more messages to multiple TWX and/or Telex subscribers in the contiguous United States and Canada.

ii) Electronic Mail Services

a) Envoy 100

Envoy 100 is a registered trademark of Bell Canada. Envoy 100 is a text communications service that provides for the transmission of messages between subscriber terminals using the digital packet-switched Datapac network. Once connection to Envoy 100 is made, subscribers can compile, edit, send, receive and store written messages in English or French.

Messages may be sent one by one or simultaneously in groups to Envoy 100 subscribers in Canada and overseas. Delivery is on a mailbox basis.

The message is stored until the addressee signs on and requests delivery. Messages can also be sent on an autodelivery basis where they are automatically delivered immediately or at timed intervals to available terminals. Envoy 100 allows message-exchange between terminal devices of different speeds and codes.

Subscribers may use teletypewriters, word processors, personal computers or any other carrier or customer-provided terminals that use the standard 7-bit ASC II code (12 characters) at speeds of 110 baud to 1200 baud. The Envoy 100 computer is accessible through the regular telephone network, the Datapac network, the TWX network or the U.S. packet switched networks (Telenet and TYMNET). Envoy 100 service is available anywhere in the world where there is a telephone and a terminal.

Envoy 100 rates consist of a fixed monthly charge plus a usage charge based on the number of kilocharacters used for message input and delivery and a storage charge based on kilocharacters stored per day.

Envoy 100 Options

Envoy Post allows Envoy 100 subscribers to send messages to nonscribers anywhere in Canada through the facilities of the Canada Post Corporation. The subscriber composes and sends the message via Envoy 100 to the CPC electronic mail center nearest the recipient. There it is printed out and delivered with the next mail delivery. Envoy Post service is also available to the United States, through the Electronic Mail Corporation of America and the U.S. Postal Service.

iii) Message Switched Services

(a) Autocom II

Autocom II is offered by Teleglobe Canada. Autocom II is an international private message switching service. The message switching computer facilities are located at Teleglobe's Montreal International Gateway, allowing interconnections with similar facilities in the United Kingdom and Canada. Interconnection may also be made on an as-required basis with Australia, France, Italy, Japan and Spain.

Autocom II operates in full duplex (asynchronous only) at transmission speeds of 50 to 200 baud with the 5-level band of 110 to 1200 baud level ASC II code. Autocom II provides speed conversion and code translation so that communicating terminals need not be speed and code-compatible.

The Autocom II rate structure consists of a fixed monthly charge for network access facilities plus a fixed monthly charge for computer input/output ports.

Autocom II is accessible by subscriber provided terminals through the domestic Telex and TWX networks or via customer designed leased telegraph channels. Autocom II subscribers may be located anywhere in Canada.

(b) Telenet

Telenet is a registered trademark of CNCP Telecommunications. Telenet is a computerized store-and-forward message switching service. It provides the capability to exchange traffic between dedicated teleprinter stations and switched Telex teleprinter stations of the same subsystem using different codes and speeds. The Telenet computer provides automatic code and speed conversion between the 5-level band of 8-level ASC II codes at speeds up to 300 band asynchronous.

Telenet subscribers have access to the general Telex network in Canada and the Telex and TWX network in the U.S.A. or to the Canadian Data Telex network. Three classes of subscriber-stations are offered. These are Class A, B and C stations.

Class A Stations are required for heavy traffic. They are uncontrolled freewheeling or controlled teleprinter terminals connected to the Telenet computer by dedicated lines. Each subscriber subsystem or closed user group must have one Class A station.

Class B Stations are required for level traffic. These stations have 2 Telex terminals connected to the Telex network. One is equipped to handle messages to and from the general Telex network as well as

messages transmitted via the Telenet computer. The second terminal is a receive-only with dedicated to receive traffic transmitted by the computer via the Datatelex network.

Class C Stations can service light traffic. They have one Telex terminal that has access to both Telenet and the general Telex network.

Other Telenet features include assignment of a sequential number, time, and date to each message, mnemonic addressing (with 3 to 5 character address codes), and priority message delivery.

Telenet rates consist of service charges, monthly rates, Telex usage charges and computer usage charges.

Telenet service is accessible by teleprinter terminals operating at speeds up to 300 baud via dedicated teleprinter circuits or through the Telex network utilizing standard Telex or Data Telex equipment.

Telenet computers are located in several locations across Canada: Halifax, Montreal, Toronto, Winnipeg, Edmonton or Calgary, and Vancouver.

iv) Circuit Switched Services

(a) Broadband Service

Broadband service is provided by CNCP Telecommunications. Broadband service is a public circuit-switched network that provides for direct subscriber-to-subscriber transmission of digital or analogue signals such as, data, message record, telemetering voice coordination and facsimile. Broadband exchange service is designed for high-speed computer data transmission. It has a speed capability of up to 9600 bps. A variety of carrier or customer-provided terminals can be accommodated including tape, punched cards, telephone handsets and associated data terminal sets and facsimile units.

Broadband exchange service is available to subscribers in the continental United States through Western Union, and to overseas subscribers of the International Datel 600 service via Teleglobe Canada.

The rate structure for Broadband exchange service consists of service charges, monthly rates and usage charges.

Subscriber terminals are connected to the Broadband network access points by carrier-provided local loop facilities of standard voice-channel characteristics. There are Broadband access points in Ontario while terminals outside of these locations can be connected with additional facilities, for which a charge will be assessed.

(b) International Datel 600

International Datel service is offered by Teleglobe Canada/CNCP. Datel service offers subscribers to the CNCP Broadband exchange service access to overseas subscribers via the facilities of Teleglobe Canada and its connective carriers. Datel service is an alternate voice/data service with a maximum transmission speed of 600 bps.

Users access Datel by dialling up Teleglobe's International Gateway facilities at Vancouver and Montreal using the public switched telephone network or the Broadband Exchange Network.

(c) Multicom 1

Multicom 1 is a registered trademark of Telecom Canada. Multicom 1 is a circuit switched service that provides for data communication and alternate use voice capability between subscriber stations.

Pre-programmed automatic dialers establish connections between Multicom 1 stations via public switched telephone (DDD) network. Transmission is two-way non-simultaneous at speeds up to 2400 bps synchronous.

Multicom 1 options include: automatic answer-unattended; exclusive (denies access to all other extensions when the designated station has the Multicom line); and integration with push button systems (permits spare buttons on the Multicom 2 telephone to terminate push button lines, signalling buttons or intercom circuits).

The Multicom 1 rate structure consists of a fixed monthly rate and a usage charge based on distance and duration of connections. The monthly rate provides for the ability to reach a maximum of 10 other Multicom 1 or Voicecom stations.

Subscriber stations are connected to the Multicom 1 network by a carrier-provided access line from the carrier-exchange separate from regular telephone lines. Terminal equipment that generates signals incompatible with the DDD network must be provided with a carrier or customer supplied modem. The modem conditions the signals generated by the terminals for transmission over the network and vice versa.

Multicom 1 service is available in the local serving areas of DDD exchanges in Telecom Canada member company territory. Service may be provided to locations outside of those areas but an extra charge will be levied for the access line. Multicom 1 service is available in Canada only.

(d) Multicom 2

Multicom 2 is a registered trademark of Telecom Canada. Multicom 2 is a circuit-switched service that provides for data communications and alternate use voice capability between carrier or customer-provided speed-compatible terminals. Designed for inter-city data transmission at higher speeds than are possible on the DDD network, the Multicom 2 network is functionally separate from the regular telephone system. Multicom 2 offers simultaneous two-way transmission at speeds up to 4800 bps. Other service features are access to all stations, fast (less 3 sec.) connection time, and unattended operation.

Service options include network security (prevents unauthorized calls from reaching stations on the customers system), exclusion (see Multicom 1) line, and integration with push button system.

Subscriber stations are connected to the Multicom 2 network by a carrier-provided 4-wire access line from the carrier-exchange. Terminal equipment which generates signals that are not compatible with the Multicom 2 network must be provided with a carrier or customer supplied Modem.

The modem conditions the signals generated by the terminals for transmission over the network and vice versa.

Multicom 2 service is available within the local-service areas of 14 exchanges in Ontario. Service is provided to locations outside of these areas but an additional charge may apply.

Multicom 2 Optional Features

Fixed Reversed Charging automatically transfers the charges for all calls to the receiving terminal.

Local Test enables business machines capable of testing their terminating equipment to send data from the transmit to the receive side of the business machine.

Equivalency allows a number of Datalink circuits to be combined into a hunt group so that incoming calls can connect to any available line in that group.

Automatic Calling Unit (ACU) enables a customer business machine with automatic calling unit compatibility to activate the dialing process through a Telecom Canada-provided ACU.

Hot Line provides automatic connection to one predetermined station on the system.

Network Security. By subscribing to a closed user group, customers will be able to ensure that other Datalink users cannot access their data base.

(e) Datalink

Datalink is a registered trademark of Telecom Canada. Datalink is a digital circuit-switched data transmission service designed primarily for the low to medium volume user requiring bulk data transfer to a centralized processing unit.

The service establishes a temporary point-to-point circuit and is capable of operating with any transmission code established between sender and receiver. Datalink provides synchronous, two-way, half or full duplex transmission at speeds of 2400, 4800 and 9600 bps. The digital signal ensures a high degree of accuracy.

The Datalink rate structure comprises a fixed monthly access charge and a usage charge based on speed, time and distance between service areas.

Datalink is accessible to all kinds of remote job entry (RJE) terminals, digital facsimile devices and communicating word processors. Analogue terminals can access Datalink through a modem.

Subcriber terminals are connected to the Datalink network exchanges by a carrier-provided dedicated access line.

(f) Infoswitch-Infoexchange

Infoswitch/Infoexchange is a registered trademark of CNCP Telecommunications. Infoexchange is one of three services offered on the Infoswitch network. Infoexchange is designed for bulk data transfer, (i.e. continuous flow of information during a call). It is a digital circuit-switched service, capable of operating with a variety of transmission codes and with transmission speeds up to 1200 bps asynchronous and 9600 pbs synchronous. The circuit-switching establishes a temporary dedicated direct circuit between the transmitter and the receiver, and so the two connected user terminals must operate at the same speed. The digital transmission signal ensures minimal distortion and inaccuracy.

Users requiring both bulk data transfer and inquiry/response-type communications may benefit from the alternate use infoexchange/infocall option, which allows them to choose the most economical service for each transmission.

The Infoexchange rate structure includes a fixed monthly access charge and a transmission charge which is related to speed and distance and proportional to duration of the call.

The Infoexchange service is accessible to the majority of existing terminals and computers without modification. Subscriber terminals are connected to an Infoswitch network exchange by carrier-provided local channel facilities. Infoexchange service is available to subscribers located within the outside local serving areas. Subscribers located outside of a service area will require additional network access facilities, for which a charge is levied.

Infoswitch-Infoexchange Optional Features

Abbreviated Addressing. The user can define an address list comprising one-or-two-character addresses instead of or in addition to the 71-digit system.

Hotline. For users who always connect with the same party - the connection is set up immediately without any need for addressing.

Retry. If the called party is busy the exchange automatically retries the call up to five times.

Collective Number Group. A single collective number is assigned to a series of terminals or to a computer party on the same continuous property. When the number is used, a connection is made to the first available terminal or computer part. Individual addressing is still available.

Closed User Group. A subscriber can elect to receive calls only from designated originators.

Reverse Charging. The user may specify his acceptance of charges for incoming calls from designated addresses or for all incoming calls.

(v) Packet Switched Services

(a) Datapac Services

Datapac is a registered trademark of Telecom Canada. Datapac is a nationwide packet switching data network that is designed to accommo-

date many users, many uses, and many types of equipment. Applications include inquiry/response, time-sharing, bulk transfer, data retrieval, and data collection.

The Datapac network consists of computerized switching nodes located in 15 major cities across Canada that are linked by highspeed (56 kbps) digital transmission trunks. The switching nodes are computers which accept streams of information packets from many user terminals, decode the addresses contained in the packet headers and route individual packets through the network to the node that is connected to the destination terminal. Datapac handles packets that are divided and formatted in accordance with the internationally ratified standard X.25 protocol for packet-node operation. With normal service, packets may have user data fields of up to 2048 bits, and average network transit delay is 0.49 seconds. Priority service (optional) offers an average network delay time of 0.27 seconds, with user data fields of maximum 1024 bits. Control procedures at each Datapac node check for transmission errors and if necessary request retransmission from the last correct station. Approximately one packet error in 10^{10} packets transmitted through the network goes undetected.

The Datapac network provides several features and methods to assist subscribers in restricting access to their systems.

In addition to priority service, optional Datapac features include Closed User Groups, Collect Call, Collect Call Blocking, Permanent Virtual Service (a permanent network-recognized association between two subscriber terminals established at subscription time) and Logical Channels for Outgoing Calls Only (ensures channel availability for outgoing call set-up and subsequent data transfer).

Datapac International Service allows users to access packet switching networks in the United States and, through Teleglobe Canada, in 21 other countries around the world.

Datapac rates consist of a network usage charge, and appropriate access-arrangement charges. The network-usage charge includes call set up

charges, transmission charges based on number of packets transmitted to and received from the network, and a switching charge that applies for transmission of data between serving areas of different grades.

Datapac is accessible by almost any type of data terminal. Intelligent terminals including computers, can access the network using X.25 protocol and a full-duplex synchronous physical connection. Non-intelligent terminals, which do not have the software capability to implement X.25, can access the network through a synchronous or asynchronous connection to a Packet Assembler/Disassembler (PAD). The PAD is a shared Datapac Facility which converts data to X.25 packet format. Subscribers may choose from six different Datapac Access Services (Datapac 3000, 3101, 3201, 3303, 3304, and 3305) which are designed to accommodate various types of customer equipment and applications.

Datapac 3000 provides support for synchronous devices such as host computers, intelligent terminals, controllers, data concentrators, etc., that conform to X.25.

Datapac 3101provides support for asynchronous teletypewriter compatible devices using ASCII code. An Interactive Terminal Interface (ITI) links these devices to the Datapac network through Packet Assemblers/Disassemblers (PADs) over dial-up or dedicated facilities. ITI conforms to the CCITT Provisional Recommendations X.3, X.28, and X.29. The user needs no special hardware or software to interface a device to Datapac.

Datapac 3201 provides support for terminals operating under the ISO Poll/Select Asynchronous protocol. Datapac 3201 links these terminals to the Datapac network through Packet Assemblers/Dissassemblers (PADs). Communications between the PAD and the terminal is carried out according to the ANSI X3.28 – 1976 line protocol as implemented by Telecom Canada.

Datapac 3303 provides support for terminals operating under the IBM 3270 Binary Synchronous Communications (BSC) protocol. Datapac 3303 links these terminals to the Datapac Network through Packet Assemblers/Disassemblers (PADs).

Datapac 3304 supports the IBM Binary Synchronous (BSC) Multileaving communications protocol on Datapac. This Datapac access service will support IBM -compatible multi-leaving hosts and remote job entry terminals. The RJE terminal, which can be either a computer or a terminal, is also known as a remote batch terminal or a work station.

Datapac 3305 supports the IBM Binary Synchronous Communications (BSC) protocol.The service supports terminals operating according to the BSC point-to-point connection mode protocol. Communications may be established between terminal to terminal, terminal host or host to host, providing application software presently exists to allow such interaction. Datapac 3305 supports (centralized computers), Remote Job Entry (RJE) or Communication Work Processors which emulate the IBM 2770/2780/3740/3770/3780 type terminal.

Datapac service is available to subscribers located within and outside of 84 Datapac Serving Areas (D.S.A.'s) across Canada. D.S.A.'s are classified into 3 grades (1, 2, or 3) for the application of rates and charges. Each grade 2 or 3 D.S.A. is associated with a specific grade 1 D.S.A.

Where service is provided to a subscriber located outside of a D.S.A., additional channels are levied for the inter-exchange data channel or Dataroute facility between the service point and the designated D.S.A. and for any other necessary data sets or Dataroute access arrangements.

(b) Infoswtich - Infocall

Infoswitch-Infocall are registered trademarks of CNCP Telecommunications. Infocall is one of three services offered on the digital packet/circuit switching Infoswitch network. Infocall allows the subscriber to transmit data in the packet-mode from almost any terminal or computer without having to implement packet protocols. The subscriber can transmit data to an Infoswitch switch at up to 1200 bps synchronous or 9600 bps asynchronous, in a variety of codes. The switch assembles the data into packets, interleaves them with packets from other users and transmits them along digital trunk lines at speeds of up to 56,000 bps to the destination switch. The destination switch depacketizes the information

and transmits it to the receiving terminal. Network transit delay time is usually less than 0.5 seconds. The undetected error rate is no more than one per 10^{12} bits transmitted.

Infoswitch - Infocall Optional Features

The Infocall/Infoexchange option permits users with both inquiry/response and bulk transmission applications to choose between packet-switched transmission and circuit-switched transmission (infoexchange) on a call-by-call basis to take advantage of the most appropriate rate structure.

The Terminal/Host Concentration option allows an Infogram packet mode host computer with a single medium speed physical connection to the Infoswitch network to communicate with up to 255 non-packet mode Infocall terminals. With Terminal to Host without concentration, low speed Infocall terminals use the Infocall service to access the host computer over a group of similar low speed ports.

Other service options include Abbreviated Addressing Camp-on (the destination switch of a busy called party, places the call in a queue and gives the signals to commence transmission of data when the called party is available), Hotline, Collective Number Group, Closed User Group and Reverse Charging.

Infocall rates include a fixed monthly access charge directly related to speed, and a transmission charge price based primarily on volume of data transmitted, with some relation to distance.

Infocall services are accessible by the majority of existing terminals and computers, without the need for external addressing devices. The terminals are connected to a CNCP exchange by carrier-provided local channel facilities.

Infocall service is available to subscribers located within or outside of 71 Infoswitch serving areas across Canada. Customers outside of these areas access the names and service area exchange by conventional facilities for which an additional charge is levied.

(c) Infoswitch - Infogram

Infoswitch/Infogram are registered trademarks of CNCP Telecommunications. Infogram is one of three services offered on the digital packet-circuit switching Infoswitch Network. The Infogram service utilizes end-to-end packet switching, requiring the use of an intelligent packet-mode synchronous device in accordance with international X.25 protocol. The subscriber terminal or computer creates packets of information and transmits them to the Infoswitch switch at speeds up to 8600 bps synchronous. The switch combines the packets from many users and transmits them over the Infoswitch network at speeds up to 56,000 bps to the destination switch. The destination switch transmits the data, still in packet form, to the receiving terminal.

A single physical link between the user and the switch can accommodate over 255 separate calls simultaneously. The end-to-end error rate is one undetected error per one billion bits transmitted.

Infogram rates consist of a fixed monthly access charge related to speed, and a transmission charge based primarily on volume of data transmitted, with some relation to distance.

Options

The Terminal/Host Concentration option allows an Infogram packet-mode host computer connected by one or more medium speed synchronous lines to use the Infoswitch network to communicate with non-packet mode terminals.

Other Infogram service options include Abbreviated Addressing, Reverse Charging, Camp-on (the destination switch of a busy called party places the caller in a queue and signals for data transmission to commence when the called party is available), Collective Number Group and Closed User Group.

The Infogram service is accessible by any intelligent terminal or computer with the ability to implement the X.25 protocol. Carrier-provided interface equipment is available should the subscriber's terminal equipment lack the ability to implement the X.25 protocol. The subscriber

terminal is connected to the CNCP exchange by carrier-provided local channel facilities.

Infogram service is available to subscribers located within or outside of the Infoswitch serving areas across Canada. Customers located outside of these areas may access the nearest service area exchange by conventional leased facilities for which an additional charge is levied.

vi) Database Access Services

(a) iNET 2000

iNet 2000 is a registered trademark of Telecom Canada. The iNET 2000 gateway offers users a single point of access to a number of on-line services and information databases, via an electronic directory. The customer chooses the service or database required, and iNet makes the connection. iNet services include Envoy 100 electronic messaging, with full text preparation, editing, storage and retrieval, and various videotex databases.

Databases accessible through iNet include news clipping services, stock market reports, travel information, income tax rates, rulings and guides to income tax assessment, models to aid in lease evaluation and preparation of business reports and financial statements, financial statistics for the Canadian banks, money market rates, company financial profiles, financial statistics by industry sector, Infoglobe, and financial newsletters, periodicals, journals, articles and abstracts. Videotex services accessible by iNet include Teleguide, Grassroots, Cantel, Marketfax and others.

Each iNet user interacts with the network through a discrete user profile, which defines language, level of expertise, level of authority, billing requirements and other user-specified parameters. iNet subscribers can also access packet switched networks in the U.S. and overseas through the network access to Dataspace.

iNet is accessible by a wide range of standard ASCII (e.g. TWX, word processors, personal computers, data terminals, PBX private systems) and NAPLPS (Telidon) videotex terminals.

Subscriber terminals can address the iNet 2000 Gateway through Datapac, dedicated circuit service or the public switched telephone network. iNet service is available to any location in Canada.

vii) Special Serving Arrangements/Facilities

(a) Dataroute

Dataroute is a registered trademark of Telecom Canada. Dataroute is a national digital data transmission system, providing full-duplex (two-way simultaneous) service at speeds from 110 bps to 56,000 bps, synchronous and asynchronous. Dataroute operates on a dedicated basis - customers lease channels in two-point, multipoint, or multidrop configurations. Two-point channels connect data terminals in two designated Dataroute Serving Areas (DSA's). Multidrop channels interconnect two or more customer terminals within the same DSA, provided that at least one other DSA is involved in the same channel. Multipoint and Multidrop configurations may be combined on the same channel. Applications include time sharing; bulk data transfer; data collection; messages; inquiry/response and information retrieval; text retrieval; and remote job entry, offline and online.

Data which is transmitted over a Dataroute channel cannot be received by terminals which are not on that channel.

Dataroute International Service links subscribers with the American Telephone and Telegraph Company's Dataphone R Digital Service in the continental United States (93 cities). Service to points overseas is available through the facilities of Teleglobe Canada.

Dataroute rates consist of a fixed monthly charge based primarily on the transmission time period (customers may choose between 24-hour service or business-day service), speed of transmission and, to a lesser extent, on distance.

Options

Dataroute services can be combined with other offerings. The two basic types of combination are dedicated analogue channels accessing the Dataroute network and dial access lines associated with Dataroute at the remote end through which users dial into the Dataroute network. Lower speed service deriving arrangements enable a customer with two-point Dataroute Service, which operates at speeds of 2400, 4800, 9600 or 19,200 bps, to derive from it two or more services which operate at lower speeds not exceeding 1200 bps.

Dataroute Multistream allows the derivation of up to 4 sub-channels from either 4.8 or 9.6 kbps Dataroute lines.

Dataroute is accessible by terminals operating at speeds up to 1200 bps asynchronous and 56 kbps synchronous. Terminals located within a Dataroute Serving Area may access Dataroute by digital private line facilities or on a dial-up basis over the analogue facilities of the regular switched telephone network. Dial access can be one-way originating only. Subscribers located outside of DSA's may connect to Dataroute Service by either dial or private line analogue facilities.

There are 82 Dataroute Serving Areas in Canada, of which 25 are in Ontario.

(b) Infodat

Infodat is a registered trademark of CNCP Telecommunications. Infodat is a national digital data transmission network, providing full-or half-duplex transmission at speeds up to 1200 bps (asynchronous) and 56,000 bps (synchronous). Infodat operates on a dedicated basis – customers lease channels connecting terminals in any two or more Infodat serving areas. Within a single serving area, the customer may have one-drop or multiple-drop service, connecting one or more terminals to the Infodat Network Dataroute subscribers. Infodat applications include: sales reporting; inventory control; credit checking; reservations and inquiry systems; and message traffic.

Infodat rates consist of a one-time service charge plus monthly rates based on transmission speed and distance.

Options

Infodat service can provide lower speed deriving arrangements that allow customers to derive two or more lower speed channels from a single higher-speed channel.

Arrangement No. 1 enables a customer with two-point digital transmission service that operates at speeds of 2400, 4800, 9600, or 19,200 bps to obtain from it two or more channels that operate at asynchronous speeds not exceeding 600 bps.

Arrangement No. 2 enables a customer with service operating at 4800, 9600, or 19,200 bps to obtain from it two or more services operating at speeds of 110 to 1200 bps.

Customers can also combine Infodat Service with Telenet or dedicated computer-directed message switching systems, taking advantage of Infodat rates where applicable.

The Infodat service is accessible by carrier-or customer-provided terminal equipment operating at speeds up to 1200 bps asynchronous and 56,000 bps synchronous. The subscriber terminals located within Infodat serving areas access Infodat by carrier-provided private line facilities. Subscribers located outside of serving areas can access the service by private line, on a one-way (originate only) dial-up basis by Telex, DataTelex or Broadband Exchange Service, or in Ontario and Quebec, on a dial-up basis over the public switched telephone network.

(c) Private (leased) Services

Customers who wish to create their own private data communications system, linking terminals in the same building, or on an intra-city or inter-city basis, may lease the channels they require from a common carrier. Instead of paying for access to a shared communications network,

customers can lease a system tailored to their particular needs that operates independently of the shared networks. Customers located outside of the designated service areas of the various carrier-shared networks can also lease channels thereby linking them to the nearest serving area.

Leased channels are categorized according to their data transmission capacities. Customers lease channels with the capacity most appropriate to their data transmission needs. The basic categories are sub-voice channels and voicegrade channels.

Sub-Voice Channels

Sub-voice channels are offered by CNCP Telecommunications and the telephone companies. Sub-voice channels are suitable for data transmission at speeds of up to 180 bps. They are usually used for private teletypewriter service.

CNCP offers 4 grades of sub-voice channels:

Schedule 1 - up to 50 bps
2 - up to 55 bps
3 - up to 75 bps
3A- up to 180 bps

Telecom Canada, Northern Telephone Ltd. and Ontario Northland sub-voice channel grades are:

Schedule 1 - up to 45 bps
2 - up to 55 bps
3 - up to 82.5 bps
3A- up to 150 bps

Sub-voice channels are available on half or full duplex basis between two-point or multi-point locations.

[Rates are based on distance between service points, data sets (audience) required, hours of service and conditioning required.]

(d) Voicegrade Channels

Voicegrade channels are available through CNCP Telecommunications, Northern Telephone Limited and Ontario Northland Telecommunications. Voicegrade channels have a bandwidth equivalent to that of a normal telephone voice channel. The standard voicegrade channel, offered by all carriers, is the Schedule 4 channel, with transmission speeds up to 1200 bps. If this is not sufficient to meet the customer's requirements, higher speed transmission can be provided on Type 4A, 4B, or 4C grade channels, with speeds up to 2400 bps, 4800 bps and 9600 bps respectively.

Voice grade channels are available on half or full duplex basis, between two or more locations (multi-point) with connections to one or more terminals at each location (multi-drop).

Voicegrade channels can be used for alternate voice/data communications. The customer may also use channel-service arrangements (carrier or customer supplied) to derive two or more channels of a lesser capacity from a single voice grade channel.

Rates for voicegrade channels are based on mileage, datasets required, and conditioning.

(e) Stratoroute 2000

Stratoroute 2000 is a registered trademark of Telecom Canada. Stratoroute 2000 is a satellite-based digital communications service designed for the medium-to-large organization which needs to transfer a significant volume of voice, data, and/or image traffic between several cities. Stratoroute integrates satellite and terrestrial transmission facilities to provide the user with a single dedicated network. Customers have the software to enable them to monitor, analyse and reconfigure their network as needed, on a real-time basis.

A customer's voice, data or image signals travel via terrestrial facilities to Stratoroute 2000 earth stations (shared stations with 8 metre antennas where it is converted to digital form) and in combination with signals

from other customers, it is transmitted to the satellite. The stations are synchronized so that each transmits in a short burst, lasting for a fraction of a second.

Subscribers to Stratoroute 2000 lease network capacity in the form of transmission units of 100 kilobits per second each, so that rates are not sensitive to distance as they are with most terrestrial services.

Stratoroute 2000 service is accessible by standard dedicated voice-band analogue facilities, and by digital terminals operating at speeds of 2400, 4800, 9600 and 19,200 bps synchronous or 56,000 bps asynchronous.

The service is presently available in Vancouver, Calgary, Toronto, Ottawa and Montreal. Further expansion is planned to include Edmonton, Saskatoon, Regina, Winnipeg, London, Quebec City and Halifax.

5. SOURCES OF FURTHER INFORMATION:

Bell Canada
Bell Trinity Square
Toronto, Ontario
M5G 2E1

CNCP Telecommunications
3300 Bloor Street West
Toronto, Ontario
M3X 2W9

Communication Division
Ontario Ministry of Transportation &
Communications
1201 Wilson Avenue
East Building
Downsview, Ontario
M3M 1J8

CRTC
Information Services
Ottawa, Ontario
K1A 0N2

Department of Communications
Government of Canada
300 Slater Street
Ottawa, Ontario
K1A 0C8

Telecom Canada
Public Relations Department
410 Laurier Avenue West
Box 2410, Station 'D'
Ottawa, Ontario
K1P 6H5

E. RADIO NON-BROADCAST

E. RADIO NON-BROADCAST

1. MOBILE VOICE AND PAGING / RADIO TELEPHONE SERVICES

i) GENERAL

Radio non-broadcast services provide for communication with mobile units that cannot be physically linked to regular communications facilities. Mobile units may be installed in vehicles and boats, or they may be portable enough to be carried by hand. The basic technology employed by these services is radio transmission.

(a) Paging Services

Paging services provide for one-way radio-signalling from a telephone to a portable paging receiver, via the radio transmission facilities of a paging company. These services generally provide for single or multi-tone signalling only – the receiver unit 'beeps' and signals the user to contact the caller or to take any other action prearranged. Some paging services provide for voice and/or alphanumeric signalling also, so that a brief message may be transmitted to the receiver.

The paging company's radio-paging equipment is connected to the regular telephone network by a Radio-Paging Trunk Line (provided by the telco to the paging company). The paging company reserves from the telco groups of seven or eight-digit telephone numbers, and assigns them as required to individual paging-receivers. To signal a particular pager-receiver from a telephone, the caller dials the appropriate number. A signal-pulse is transmitted from the telco central-office along the trunk line to the paging company's terminal equipment. A radio-signal is then transmitted from an antenna, to be picked up by the receiver, providing it is within range of the transmitter. Each receiver is allocated one or more channels for receiving signals.

The channel bandwidth is small since only a single or multi-tone signal is being transmitted. Where voice and/or alphanumeric signalling is provided, channel bandwidth is greater. The 50 MHz, 150 MHz and 400 MHz frequencies are allocated by the Department of Communications for radio-paging services.

(b) Mobile Radio Services

Mobile radio services provide for two-way communications between mobile radio-units. These system services are essentially the same as radio paging services except that the base-station and mobile units are equipped for both receiving and transmitting voice messages. Manual mobile radio services require the caller to establish the call through the mobile-operator. Automatic service permits direct calling from unit to unit. In either case, the call must go through the base-station in order to be retransmitted at the frequency channel allocated to the receiving unit.

(c) Cellular Radio Services

Cellular radio services offer the potential to free mobile radio from the limitations imposed by scarce spectrum space. Conventional mobile radio services must compete for spectrum space with all other users of the spectrum. The bandwidth that is allocated for mobile radio can be used by only a limited number of units, since each requires its own frequency, and the same frequency cannot be used by more than one unit within the transmission range of the base station. In cellular radio systems, the serving area is divided into a number of contiguous 'cells'. Each cell is served by a low power radio transmitter that is connected by voice lines to the mobile central office. (see Figure 2)

Each transmitter operates at a designated range of frequencies while the same frequency ranges are used in non-contiguous cells. The cell boundary is the approximate limit of the range of the transmitter signal. Mobile radio units are not assigned any one particular channel but receive and transmit on whatever channel is available in the cell in which they are located. As the unit moves within the cell, the transmitter monitors a control signal that is constantly emitted by the unit. When

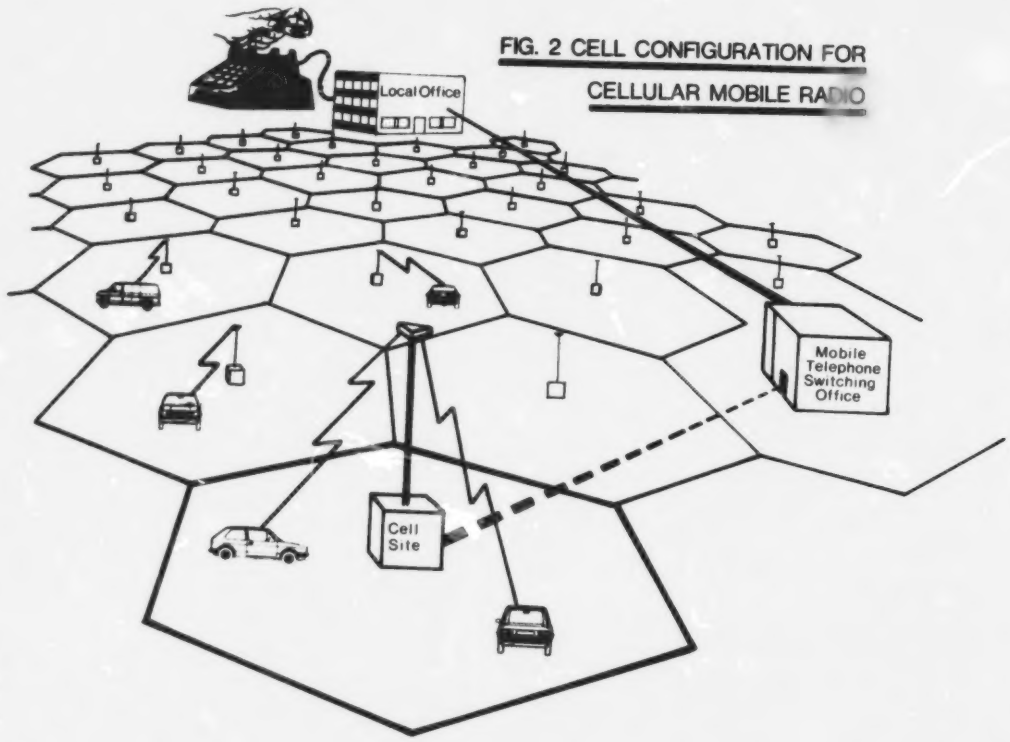


FIG. 2 CELL CONFIGURATION FOR CELLULAR MOBILE RADIO

the control signal deteriorates, indicating that the unit is approaching the cell boundary the transmitter signals the switching equipment at the mobile central office, and the conversation is automatically switched to the transmitter in the next cell, at a different frequency. The channel that had been used in the first cell is then available for use by some other unit. Each serving area may employ over 300 independent frequency channels, and an entire system can accommodate thousands of calls simultaneously. The mobile central office can be interconnected with the regular telephone network so that cellular radio becomes a mobile telephone service.

ii) INDUSTRY STRUCTURE

Mobile voice and paging services are provided by most telephone companies and by over fifty private-sector firms in Ontario. Companies providing these services are referred to as Radio Common Carriers, and the industry is represented by a national organization – the Canadian Radio Common Carriers Association.

Cellular radio services will be provided across Canada starting in mid-1985 by Cantel Cellular Radio Group Inc., a private company, and by the local telephone companies (in Ontario, Bell Cellular Ltd.). In Ontario, the following cities are licensed to be served: Hamilton, Kitchener, London, Oshawa, Ottawa, St. Catharines, Sudbury, Thunder Bay, Toronto, Windsor.

iii) REGULATORY STRUCTURE

Radio common carriers require a licence from the federal Department of Communications (DOC), pursuant to the Radio Act and the General Radio Regulations. (Under the Regulations, these services are classified as "Restricted Public Commercial Services"). DOC assigns spectrum space to each licensee. Paging services and cellular radio telephone services are largely regulated by the CRTC because of their competitive status.

2. GENERAL RADIO SERVICE (CB Radio)

i) GENERAL

General Radio Service (GRS) or Citizen Band (CB) Radio provides for personal short-range, two-way radio communications. The service is not offered by carrier-companies. It is available to any qualified Canadian citizen upon application to the Department of Communications for licensing (see Regulatory Structure).

A GRS set is a small radio receiver-transmitter that can be installed in a car or in the home. The set operates in the GRS band between frequencies 29.96 mHz and 27.41 mHz. This band is divided into 40 channels, each of which can carry one conversation within the range of the transmitting sets. (The range may vary from 5 to 40 kilometres).

All sets can receive and transmit on all channels. Calls are set up by the parties tuning into the same channel and verbally identifying themselves, using call signs assigned by DOC. Any other sets tuned into the same frequency will be able to hear the conversation, and multi-party conversations are possible. One of the GRS channels – Channel 9 – is reserved for emergency use, and is monitored by the police.

ii) REGULATORY STRUCTURE

The Radio Act requires that every GRS set be licensed by the federal Department of Communications. Applicants must be 16 or over, be Canadian citizens, landed immigrants or officers of the company in whose name they are applying. They must certify that the station will be operated in accordance with the General Radio Regulations. The set itself must be type-approved by the DOC in order to ensure that it will not cause undue radio interference.

3. SOURCES OF FURTHER INFORMATION:

Bell Cellular Ltd.
190 Attwell Drive
Suite 600
Rexdale, Ontario
M9W 6H8

CNCP Telecommunications
3300 Bloor Street West
Toronto, Ontario
M3X 2W9

Canadian Radio Common Carriers
Assocation
11 Adelaide Street West
Suite No. 803
Toronto, Ontario
M5H 1L9

Cantel
40 Eglinton Avenue East
Toronto, Ontario
M4P 3A2

Communications Division
Ontario Ministry of Transportation &
Communications
1201 Wilson Avenue
East Building
Downsview, Ontario
M3M 1J8

Department ofCommunications
Government of Canada
300 Slater Street
Ottawa, Ontario
K1A 0C8

F. BROADCASTING

1. RADIO

i) GENERAL

Radio broadcasting refers to the conveyance of audio programming from station to listeners by means of radio waves.

Sound waves, usually in the form of live news, recorded music etc., are produced at the source. The transmitter imprints the low frequency sound wave onto a higher frequency carrier wave, a process known as modulation. The modulated carrier wave is broadcast from the transmitter antenna and travels through space to be picked up by receiving antennas – usually radio sets. The receiver performs the same function as the transmitter, in reverse. It demodulates the carrier wave and reproduces the sound wave for the listener. Since the carrier wave travels at the speed of light, the listener hears the sound from his radio virtually at the same time as it is broadcast from the radio station.

The range of the broadcast signal, and the quality of sound received by listeners, are determined by a number of factors, including the technological sophistication of the broadcasting and receiving equipment. Most significant, however, are the power and height of the transmitting antenna, and the type of modulation used.

The strength and range of the broadcast signal increase with (a) the amount of electrical current supplied to the transmitting antenna, and (b) the height of the antenna. Two basic types of modulation are used to imprint sound waves onto carrier waves. In amplitude modulation (AM), the frequency of the carrier wave remains constant, and its amplitude is varied in proportion to the amplitude of the sound wave. AM broadcasting utilizes carrier waves in the Medium Frequency range.

In frequency modulation (FM) the frequency of the carrier wave is varied in proportion to the amplitude of the sound wave. FM broadcasting utilizes Very High Frequency carrier waves.

Medium Frequency "ground" waves travel along the curved surface of the earth, and are capable of bending around obstructions. AM signals may therefore be received by antennas located beyond the horizon or on the far side of hills from the broadcasting antenna. Their range is limited however, by a gradual tilting of the wave as it moves away from the transmitter.

Very High Frequency "space" waves travel in straight lines through the portion of the atmosphere closest to the earth. These waves are subject to obstruction and reflection by tall or massive objects. FM signals may, therefore, only be received by antennas within a line-of-sight path from the transmitting antenna. They have a smaller maximum range (20-100 miles) than do AM signals.

Within the reception area, however, FM broadcasting is capable of producing sound of a higher quality than AM Broadcasts. There are several reasons for this:

1. There is little "noise" associated with high frequencies which would interfere with the FM broadcast signal. Noise refers to any naturally occurring or man-made signals coming from sources other than the transmitter;

2. The integrity of the FM signal is further protected by the way in which space on the FM portion of the electromagnetic spectrum is allocated to broadcasters. There are fewer FM stations than AM stations, and between them is a "guard band" of unused frequencies, thus reducing interference from adjacent broadcast signals;

3. The FM process itself requires that a greater portion (bandwidth) of the spectrum is used to carry the signals and so a greater range of sounds may be imprinted and broadcast.

Radio broadcasters may extend the geographical range of their programming by the use of relay transmitters. These are usually installations comprised of a receiving and transmitting antenna which picks up the broadcast signal from the originating station, and rebroadcasts it to areas beyond the range of the original signal.

ii) INDUSTRY STRUCTURE

The Canadian Broadcasting Corporation (CBC), a federal Crown Corporation, operates 4 national commercial-free radio networks: English language AM and FM, and French language AM and FM. In Ontario, the CBC owns 6 AM originating stations (English, French), 5 FM originating stations (English, French), and 62 relay transmitters. 24 privately owned affiliate stations carry a mix of CBC AM and local programming, while privately owned rebroadcast stations carry CBC programming only. In addition there are 96 privately owned AM radio stations and 53 privately owned FM radio stations in the Province. (see Appendix I)

iii) REGULATORY STRUCTURE:

The technical aspects of radio broadcasting are regulated by the federal Department of Communications (DOC). Under the Radio Act, DOC is responsible for licensing all radio broadcast transmitters. The principal function of the licensing process is the allocation of spectrum frequencies among the broadcast undertakings. In assigning frequencies, the Department is concerned not only with the prevention of interference in the broadcasts, but also with meeting the needs and demands of Canadians for radio services. The broadcaster's licence to use a particular frequency is subject to such conditions as the Department may specify and does not confer any rights of ownership over the assigned frequencies.

As a further means of ensuring interference-free radio services, DOC prescribes technical standards for broadcasting equipment and procedures, and issues the certificates of construction and operation required for all broadcast transmitters.

Non-technical aspects of radio broadcasting are regulated by the Canadian Radio-television Telecommunications Commission (CRTC). Under the Broadcasting Act, the CRTC is responsible for implementation of the national broadcasting policy that is set out in s.3 of the Act. The policy pertains mainly to content and availability of radio services, requiring a broadcasting system that safeguards, enriches and strengthens

the cultural, political, social and economic fabric ofCanada; that provides varied and comprehensive programming, using predominantly Canadian resources; and that is available to all Canadians in both English and French.

The Act also empowers the CRTC to make regulations and to issue, amend, and revoke broadcasting licences. Existing CRTC regulations require radio broadcasters to submit a Promise of Performance as a condition of licensing. This document contains details of language of broadcast, duration of programming in each of the content categories, community access, music plans and policies, Canadian content, mosaic, and programming format. Once a licence is issued by the CRTC, the station is bound to conform to its Promise of Performance, which may be amended only with the consent of the CRTC.

2. TELEVISION

i) OVER AIR

a) GENERAL

Television programming is broadcast in much the same way as is radio programming. A transmitter imprints the program information onto a carrier wave, and the modulated carrier wave is radiated from the transmitting antenna, picked up by a receiving antenna on a television set, decoded to reproduce the program.

The television signal, however, contains much more information than a radio signal: in addition to sound, it must convey the picture, colour, and movements. To carry all of this information, a single television requires as much spectrum space – or 'bandwidth' – as 600 AM radio stations. Television signals are, therefore, broadcast on the Very High Frequency (channels 2 to 13) and Ultra High Frequency (channels 14 to 70) portions of the spectrum, where the required bandwidths are available. Since waves of these high frequencies travel in straight lines, TV signals are limited in range to miles. Obstruction and reflection of the signal by intervening objects means that reception is possible only in a line-of-sight path from the transmitting antenna. (Reflection of signals is the cause of 'ghosting' on theTV screen, as the set picks up both the original and reflected signals). These effects become more noticeable with higher frequencies, hence the limited use of UHF channels.

The geographical range of television programming may be extended by relay transmitters, which pick up and retransmit the signal. Television signals are also broadcast nation-wide by satellite or over Super High Frequency microwave relays.

b) INDUSTRY STRUCTURE

OWNERSHIP AND NETWORK AFFILIATION
OF ONTARIO TELEVISION BROADCAST
UNDERTAKINGS

	NETWORK OWNED		AFFILIATES	
NETWORK	ORIGINATING	REBROADCASTER	STATION	REBROADCASTER
CBC	3	69	11	10
TVO	1	39	-	-
CTV	-	-	9	15
Global	1	5		
Independents	3			

The Canadian Broadcasting Corporation (CBC) operates two national television networks, one English and one French. Of the 32 originating stations in Ontario, 14 are owned by or affiliated with the CBC. In addition, the CBC owns 69 rebroadcast stations, and has 10 privately-owned rebroadcast affiliates.

TV Ontario (TVO) is the network of the Ontario Educational Communications Authority, a provincial agency responsible to the Ministries of Citizenship and Culture and Education. TVO's mandate is to provide programming to meet the entertainment and educational needs of Ontarians. TVO utilizes one transmitter on the CN Tower for the Toronto region and 14 high and medium power transmitters and 91 low power transmitters to serve the rest of Ontario. In addition, 24 cable companies receive signals directly from the satellite. Currently, TVO reaches 95 percent of the population of Ontario. Seventeen percent of TVO's broadcast schedule is French-language programming.

The CTV Network is a national English television network which is owned by its 14 largest affiliate stations. Nine of the 32 originating stations in Ontario are CTV affiliates.

The Global Television Network (Global) is a privately-owned English network consisting of one originating station which is located in Toronto, and five rebroadcast stations serving southern Ontario.

Independent Stations. In addition to the four networks operating in Ontario, there are also three independent stations: CHCH in Hamilton, CITY-TV in Toronto, and CFMT in Toronto (a multilingual station).

(c) REGULATORY STRUCTURE

Television broadcasting is regulated by the federal government. Under the Radio Act, the Department of Communications (DOC) is responsible for issuing the technical construction and operating certificates that are required of all broadcasting stations. The Act empowers DOC to determine the transmitting power and frequency of each station, and to prescribe technical standards for broadcast equipment and operation. Detailed standards and requirements for technical certificate applications

are contained in the General Radio Regulations and in the Broadcast Procedures.

Non-technical aspects of television broadcasting are regulated by the Canadian Radio-television and Telecommunications Commission (CRTC). Under the Broadcasting Act, the CRTC is responsible for implementation of the national broadcasting policy that is set out in s.3 of the Act. The policy pertains mainly to content and availability of television services, requiring a broadcasting system that safeguards, enriches and strengthens the cultural, political, social and economic fabric of Canada, that provides varied and comprehensive programming, using predominantly Canadian resources and that is available to all Canadians in both English and French.

The Act empowers the CRTC to make regulations and to issue, amend, and revoke broadcasting licences. The Commission may make individual licences subject to such conditions related to the circumstances of the licensee as are deemed appropriate for the implementation of the national broadcasting policy.

The Commission is required to hold public hearings in connection with the issue, revocation and suspension of all broadcasting licences. Licences may be revoked or suspended by the CRTC if the licensee has failed to comply with any of the conditions.

ii) CABLE TELEVISION

(a) GENERAL

Cable television was pioneered in Ontario and originated as a means of bringing television signals to communities where off-air reception was made difficult or impossible because of hilly terrain or distance from the transmitting station. A sensitive antenna would be erected near the community, at the highest possible elevation. The television signals picked up by the antenna were then distributed by cable to individual homes in the community. This was essentially a distribution service, providing subscribers with a few local channels which they otherwise would not receive.

Today, cable systems in Ontario operate in areas where off-air reception of local signals is available and offer subscribers as many as 35 different channels, including distant stations whose signals have been imported by satellite or microwave from across the continent.

The headend is the cable company's "station". An array of sensitive antennas, microwave receivers and satellite dishes pick up television signals off-air. These are electronically processed for cable transmission. Signal levels are adjusted to prevent overpowering of weaker signals by stronger ones on adjacent channels, and UHF, satellite and microwave signals are converted to lower frequencies.

Most cable companies also maintain their own production facilities, so that at least one of the cable signals originates locally. This channel often carries textual information, (news, weather and public notices) and local interest programming.

Signals are transmsitted from the headend to subscribers by the distribution system, a hierarchical cable network, comprising trunk lines, feeder lines, and drop lines. The drop lines connect to individual houses/television receivers.

The coaxial cable that is the basis of the cable network consists of an inner conductor (usually copper wire) separated from a larger diameter outer conductor (aluminum) by a layer of insulating plastic foam. The insulator maintains an electric field between the two conductors. The whole is surrounded by a protective plastic sheathing.

Television signals may be transmitted along the cable at frequencies ranging from 30 mHz to 300 mHz. (Hence the need to convert the higher frequency UHF, satellite and microwave signals). At 6 mHz per television channel, the cable is theoretically capable of carrying 40 channels.

As the electric signal progresses along the cable, it loses strength at the rate of approximately 1/100 original strength per 2000 feet of cable. Loss of signal strength produces 'snowy' television pictures. It is coun-

teracted by amplifiers placed at intervals along the cable. The amplifiers however do not discriminate between televison signal and undesirable noise that is produced both by the cable and the amplifiers. The strength of all signals is boosted so that the number of amplifiers, on the network, and hence the length of cable must be limited. In addition, amplifiers do not have the capacity to handle all of the 40 channels that the cable is capable of carrying. Advances in cable and amplifier technology, however, are constantly increasing the signal carrying capacity of cable systems, and new state-of-the-art systems can carry up to 100 channels.

Cable television distribution has significant advantages over distribution by radiation (over air). Radiated television signals compete for space on the electromagnetic spectrum with other services such as FM radio and mobile radio. Even though it is technically possible to have as many as 45 VHF television channels, other signals leave room on the spectrum for only 12. There is also room for about 70 UHF TV channels at Ultra High Frequency, but transmission characteristics are not as good at these frequencies, and only a few UHF Channels are used. In contrast, the cable distributor is free to allocate the frequencies or cable as he chooses, being limited only by the technical capacity of the cable. Furthermore, since signals are physically confined to the cable, two (or more) cables each carrying a full range of channels may be laid right next to each other, with no interference between signals of the same frequencies. This means that the number of channels potentially available in any one area is limited only by the number of cable networks installed.

Transmitters radiating television signals of the same or adjacent frequencies on the other hand, must be separated by hundreds of miles in order to prevent interference. In any one locality, only one of each channel can be transmitted over-air. A further advantage of cable distribution is that the signal is not subject to external interference by atmospheric or man-made noise, and it is not reflected or obstructed by buildings and hills.

(b) INDUSTRY STRUCTURE

As of 1984 there were 170 licensed cable systems in Ontario all owned by the private sector. Many cable licensees own and operate only one

system, but several operate more than one system. The two largest cable companies in Ontario, Rogers Cable TV Ltd. and MacLean-Hunter Cable TV own 12 and 16 systems respectively.

(c) REGULATORY STRUCTURE

The Radio Act empowers the DOC to determine the transmitting power and frequency of each station, and to prescribe technical standards for equipment and operation.

The non-technical aspects of cable broadcasting, such as rates and carriage priorities are regulated by the CRTC. Under the Broadcasting Act, the Commission is responsible for implementation of the national broadcasting policy that pertains mainly to content and access.

3. SOURCES OF FURTHER INFORMATION

Ontario Broadcasting Companies
(See Appendix III)

Communications Division
Ontario Ministry of Transportation &
Communications
1201 Wilson Avenue
East Building
Downsview, Ontario
M3M 1J8

Information Services
CRTC
Ottawa, Ontario
K1A 0N2

G. SATELLITE SERVICES

G. SATELLITE SERVICES

G. SATELLITES

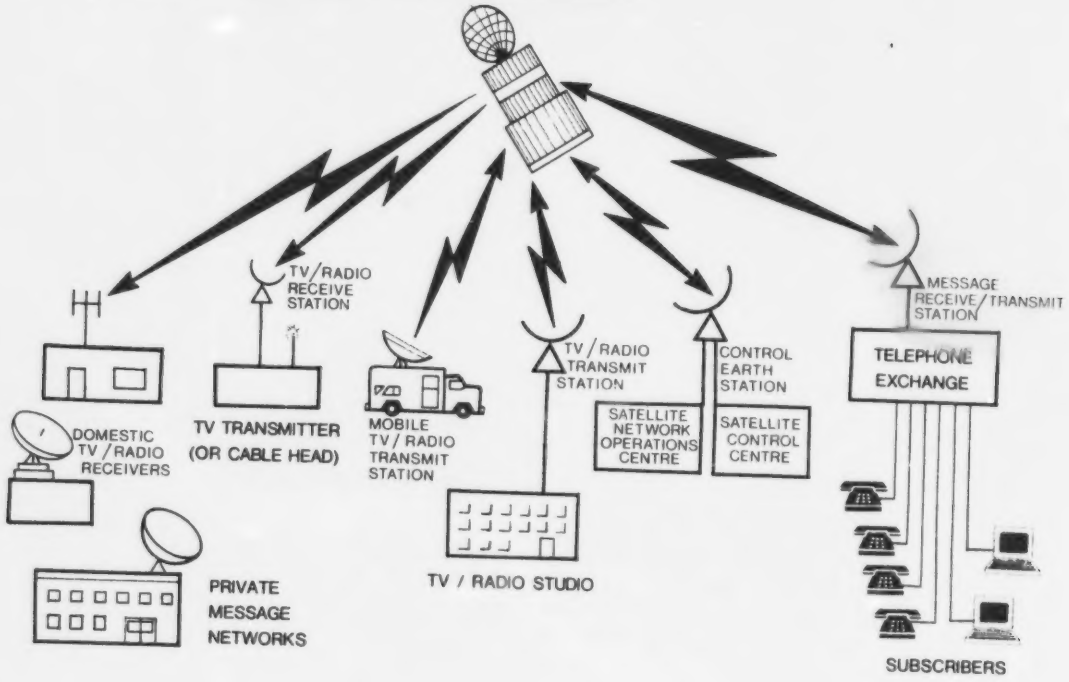
1. GENERAL

For the past 20 years, Canada has been developing a domestic satellite communications system that has the potential to disseminate information of all types – voice, video and data – efficiently, reliably and with no regard for distance or geographical barriers. Satellite systems, therefore, have many advantages in a vast and sparsely settled country. As communications networks expand and change in response to new demands and the availability of new technology, satellites will remain a vital part of the overall communications system in Canada.

Services available via satellite include anything that is being communicated terrestrially. Therefore, current services available through satellite communications systems include: voice, computer data, teleprinter, facsimile, video and audio teleconferencing, television, electronic mail, etc. (see Figure 3). The satellites orbit over the equator in a geosynchronous or geostationary orbit (i.e. satellites orbit at the same speed as the earth turns on its axis) thus eliminating the need for actuated tracking systems for satellite dishes. The transmission originates at the source where the signal is generated, processed and fed to an "uplink" dish which beams the signal to the orbiting satellite. The signal is then beamed back to earth by the satellite and is received by a "downlink" dish. In order to receive the signal, a satellite receiving dish must be placed within the area covered by the footprint and its feedhorn should point in towards the satellite. The strength of the downlink signal is not uniform throughout the satellite "footprint" or geographic area covered by the satellite signal. Footprint charts resemble a series of crude concentric circles with the signal strongest at the centre of the innermost circle and proportionately weaker at points farther from the centre.

In order to receive a satellite signal, a satellite dish made of highly reflective materials is used to gather and focus the signal to the feedhorn

FIG. 3 TYPICAL USES OF A COMMUNICATIONS SATELLITE



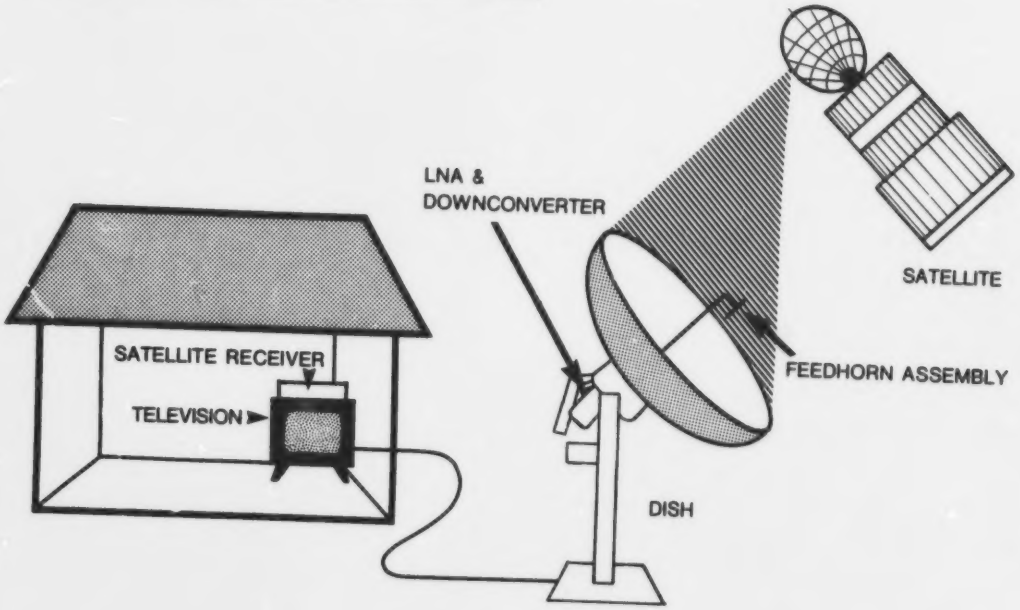
located at the focal point of the dish where it is amplified by a low noise amplifier. The signal is then channelled to the downconverter where the frequency is lowered and the signal is passed on to the receiver (see Figure 4).

3. INDUSTRY STRUCTURE

Telesat Canada, established as a Canadian corporation in 1969, was given a monopoly position to install and operate a commercial satellite communications system throughout Canada. Telesat is a partnership comprised of Telecom Canada (the major telephone companies in Canada) and the Federal Government, and operates a communications system which includes active 6/4 GHz and 14/12 GHz satellites in geostationary orbits; tracking, telemetry and command facilities; a satellite control centre; and over one hundred earth stations. Earth stations are linked by terrestrial facilities to telephone exchanges, broadcasting and radio stations/studios, CATV headends, and mining and construction camps. In addition, transportable earth stations are available for temporary use and offer benefits in cost-effectiveness and flexibility

Telesat functions as a "carrier's carrier" and leases channels to large broadcasters and the regulated common carriers rather than to end users The company is integrated into the national telecommunications network thus ensuring that satellite channels are marketed only to the list of regulated carriers through prescribed terrestrial carriers. The usage of satellite services in Ontario is dominated by a few major users such as the CBC, Canadian Satellite Communications (CANCOM) and the Globe and Mail. The smallest increment of capacity available to the user in Ontario is one percent of a satellite channel which Telesat offers for approximately $1850 per month. In addition, the Ontario user has to pay carrier's markup both for the space segment and the terrestrial facilities. Occasional use satellite service is available through the common carriers though the associated rates are roughly triple the cost of full-time use. Ontario users are at present restricted from the resale or sharing of satellite capacity.

FIG. 4 DIRECT BROADCAST SATELLITE SYSTEM



3. REGULATORY STRUCTURE

Satellite frequencies are allocated by the federal Department of Communications. However, Telesat rates, terms and conditions of operation fall under the jurisdiction of the CRTC under the Railway Act.

4. SOURCES OF FURTHER INFORMATION:

Information Services
CRTC
Ottawa, Ontario
L1A 0N2

Department of Communications (DOC)
Government of Canada
300 Slater Street
Ottawa, Ontario
K1A 0C8

Communications Division
Ontario Ministry of Transportation &
Communications
1201 Wilson Avenue
East Building
Downsview, Ontario
M3M 1J8

Telesat Canada
333 River Road
Ottawa, Ontario
K1L 8B9

H. VIDEOTEX

H. VIDEOTEX

H. VIDEOTEX

1. GENERAL

Videotex is a communication system that provides for the creation, storage, transmission and retrieval of colour graphics and text for display monitors or computer terminals.

The information provider is the means for creating, editing and updating the visual 'pages' of information that will be displayed on user screens. The host computer stores the pages in a database, and enables retrieval by users. The transmission channel conveys the pages of information in a coded signal to the user-terminals. The decoder translates the videotex signal into a TV signal, which generates the visual page image on the TV screen. The user interacts with the system using a standard keyboard or, with some terminals, by touching the screen. With a few simple commands the user can call up an index page listing the contents of the database and retrieve the specific information required, holding each page on-screen for as long as required. In addition, the user can ask for more detailed information if necessary, or move on to a new information category. In addition to simple information-supply, Videotex can provide educational instruction tailor-made to the needs of the user, or can be used as a home-shopping and home-banking service, with the user entering purchase orders and instructions for desired transactions from the comfort of an armchair.

The only equipment required to receive Videotex information is a decoder and a slightly modified colour television set. With the appropriate software and hardware, videotex may also be accessed with standard personal computers.

The key to the videotex system is the procedure or protocol which is used to encode the two-dimensional coloured pictures. In North America a standard protocol – North American Presentation Local Protocol Syntax

(NAPLPS) has been accepted for use with all videotex systems. NAPLPS was developed by the Canadian Department of Communications, A.T. & T., and the F.C.C. under the name Telidon. Telidon was accepted as the industry standard because it is a highly efficient system that allows for the encoding of a high-resolution graphics in thousands of colours, using minimal storage and transmission.

2. INDUSTRY STRUCTURES

The videotex/teletext industry encompasses both the public and private sectors.

The federal Department of Communications (DOC) was responsible for developing the Telidon protocol which in November 1983 was accepted as the North American standard for, videotex and teletext systems. The Department continues to play an active role in developing and promoting Telidon-based services. DOC administers the Telidon Context Development Program, which provides funding to organizations for the development of software and context for videotex/teletext systems, and is itself a supplier of Telidon services.

The Ontario Government is also active in the videotex/teletext industry with the Communications Division of the Ministry of Transportation and Communications assuming a role in development and promotion. The Ontario Government is also a supplier of videotex/teletext services, including Teleguide and the Telidon Aviation Briefing System (TABS), in cooperation with the federal Department of Transport.

In the private sector, many firms (universities and other organizations) are involved in various aspects of the videotex/teletext industry, including the development and provision of software and hardware, the supply of consulting and information services and the promotion of actual systems. The sector employs approximately 1500 Canadians and approached sales of 100 million dollars in 1984.

3. REGULATORY STRUCTURE

A Canada/United States committee consisting of government and industry representatives (hardware, software, telephony representation) was set up in order to co-ordinate standards issues. Regulations that have been instituted are dependent upon the carrier.

4. VIDEOTEX SERVICES

i) Teleguide

Teleguide, a tourist information service provided by Infomart and designed for visitors and residents of Ontario, offers a complete guide to the leisure and recreational facilities and events in the Province. The database contains over 60,000 pages of information. Current listings include:

- Attractions
- Accommodation
- Restaurants
- Entertainment, Theatre and Nightlife
- Shopping and Services
- Visitor and Convention Information
- Transportation and Tours
- Sports and Recreation
- Business and Finance
- Community and Government

Five hundred and twenty-five publicly-accessible Teleguide terminals are located in hotels, shopping malls, tourist attractions, transportation centres and information bureaus in Toronto and around Ontario

Teleguide terminals are connected to the Teleguide data base by a dedicated statistically-multiplexed telephone network.

ii) Grassroots

Grassroots is the Infomart agricultural database offering subscribers a wide range of constantly updated information of interest to the modern

farmer or agribusinessman. Topics covered include: crop education, farm labour pools, energy, farm management, supplies and services market reports, weather, financial news, financial planning aids, government services, livestock, money management, mortgages, insurance and products. Grassroots also provides a number of interactive services such as teleshopping and electronic messaging which provides for direct communication between the subscriber and the information providers.

Gateway services give subscribers access to databases outside of Grassroots. The Bank of Montreal offers home-banking through Grassroots. Customers can conduct transactions such as account transfers, and account balance enquiries and request specific banking information. Transactional services allow customers to 'teleshop' via the Grassroots system. Interactive farm management services provide the subscriber with programs for personalized financial analysis and planning.

Grassroots is accessible by a colour monitor set or personal computer equipped with a decoder. The user terminal is connected to the Grassroots database by a telephone line, using a toll-free number or Datapac network facilities. Grassroots is available on a subscription basis only. Rates consist of a one-time installation charge, terminal rental or purchase charge, and a fixed monthly charge which entitles the user to 15 hours of free use per month. Charges are levied for connect-time in excess of 15 hours.

The subscriber will also be charged by the local telephone company for the use of the telephone line.

iii) Telidon Aviation Briefing System (TABS)

The Telidon Aviation Briefing System is offered by the Ministry of Transportation and Communications, the Ontario Ministry of Industry and Trade, Canada Department of Transport and Meteorological and Environmental Planning Ltd. TABS is a two-way interactive system that provides colour graphic pre-flight weather briefing information to Ontario's pilots. Information available includes actual and forecast aviation weather reports, including charts, cloud coverage, radar scans, and maps.

Tabs can be accessed using home computers or with a portable decoder on a TV set at home or away. In addition, 24 terminals have been installed in 15 airports from Oshawa to London.

iv) Vet-Tel

Vet-Tel is an information service for veterinarians provided by the University of Guelph. The Vet-Tel database includes latest research findings, epidemiological information, products, services and professional upgrading opportunities. Vet-Tel is an interactive service, offering: a service to link veterinarians with each other, with government agencies and farm clients; inventory control; and programs to aid in diagnosing and treating illness, in making decisions such as whether to buy or rent, on what mortgage terms to arrange, and on how to optimize use of buildings and equipment. Vet-Tel subscribers also have access to the Grassroots database.

Vet-Tel is accessible by customer-owned NAPLPS terminals that are connected to the database by dedicated telephone lines. Subscribers pay a monthly fee to access the database (in addition to the applicable local telephone company charges for the telephone line).

v) Marketfax

Marketfax is a stock-market analysis service that is offered by F[illegible] Information Systems and covers the New York, Toronto, American, Vancouver and Chicago exchanges. Subscribers can generate moving averages, point and figure charts, trend lines, commodities and price and volume listings.

The Marketfax service is accessible using a videotex terminal or IBM personal computer configured to accept videotex. Access is through the Datapac network only.

vi) Edutex

Edutex is an English/French service provided by TVOntario (TVO), which provides information on careers, training opportunities, courses available, institutions and costs, and is based on the Ontario Ministry of Education's Student Guidance Information Service. Other offerings

include: sections on science and technology; heart disease; information on TVOntario's services, and the Telichart system (a system for generating charts from Statistics Canada data.)

Public-access Edutex terminals are located in over 100 client high schools, libraries and Youth Employment Centres in Ontario. The terminals are linked to the Edutel database by telephone lines.

vii) Edutel

Edutel is a TVOntario teletext service, providing information on news, weather, healthcare, education, financial services, community events and the arts. Teachers and school administrators can also access the Ministry of Education's administrative network. (In the future, Edutel will also carry courses authored by teachers and students.)

Edutel is accessible by videotex terminals that can receive information from the database by broadcast, data telephone line, cable, or satellite.

viii) BN Infovision

Infovision is an English/French news service designed for cable television and offered by Broadcast News Limited. Broadcast News editors prepare synopses of news stories, and illustrate them with appropriate graphics from a standard library. The pages are distributed in continuous half-hour cycles from the Infovision database to cable headends, where it is decoded and transmitted to home television sets over the cable distribution network. News pages can be coded for priority, category (news, weather, sports, business, etc.) and region of interest.

Infovision is accessible by client cable companies using NAPLPS decoders to directly feed the cable network. The cable company decoders receive the videotex information via the CNCP Infodat network.

ix) Infonorth

Infonorth is a general interest information service provided by Infonorth Computing Inc. which uses videotex, teletext and/or open-channel distribution to reach cable TV subscribers in 11 Northern Ontario com-

munities. The database, located in Sudbury, includes information pages on news, jobs, weather, roads, tourism, consumer affairs, instructional modules and continuing education.

Cable companies that are equipped with NAPLPS decoders may access the InfoNorth service via microwave, direct-dial telephone lines or Datapac facilities. The service is then redistributed on the local cable TV channels and is available to cable subscribers with a normal TV channel converter. In Sudbury, InfoNorth service is also available on a "full channel" basis. Expanded information packages are inserted on a Sudbury cable system channel by a teletext encoder. Approximately 22,000 cable subscribers can access this service by renting or buying a dual mode teletext/videotex converter. Access to the fully interactive programs (e.g. advanced instructional modules, personalized exercise program and home repairs) is available to those with specialized equipment.

5. SOURCES OF FURTHER INFORMATION:

Communications Division
Ontario Ministry of Transportation &
Communications
1201 Wilson Avenue
East Building
Downsview, Ontario
M3M 1J8

Department of Communications
Government of Canada
300 Slater Street
Ottawa, Ontario
K1A 0C8

Telecom Canada
Public Relations
410 Laurier Avenue West
Box 2410, Station 'D'
Ottawa, Ontario
K1P 6H5

APPENDIX I

RADIO STATIONS
ONTARIO

APPENDIX I

RADIO STATIONS
ONTARIO

LOCALITY	RADIO STATION	AM/FM	FREQUENCY
Ajax	CHOO 97 McMaster Ave. L1S 2E6 (416) 683-4131	AM	1390
Atikokan	CFAK Box 800 Fort Frances P9A 3N1 (807) 274-5341	AM	1240
Bancroft	CJNH Box 730 K0L 1C0 (613) 332-1423	AM	1240
Barrie	CHAY Box 937 L4M 4Y6 (705)737-3511	FM	93.1
	CKBB Box 950 L4M 4V1 (705) 726-9500	AM	950

Belleville	CIGL Box 488 K8N 5B2 (613) 968-5555	FM	97.1
	CJBQ Box 488 K8N 5B2 (613) 968-5555	AM	800
Big Trout Lake	CFTL P0V 1G0 (807) 537-2260	FM	100.3
Blind River	CJNR 10 Lawton St. F0R 1B0	AM	730
Brampton	CFNY 83 Kennedy Rd. S. L6W 3P3 (416) 453-7452	FM	102.1
	CKMW 83 Kennedy Rd. S. L6W 3P3 (416) 453-7111	AM	790
Brantford	CKPC Box 507 N3T 5P8 (519) 759-1000	AM	1380
	CKPC (see CKPC 1380)	FM	92.1

Brockville	CFJR Box 666 K6V 5V9 (613) 345-1666	AM	830
Burlington	CING 4144 South Service Rd. L7L 4X5 (416) 681-1079	FM	107.9
Cambridge	CFTJ 46 Main St. N1R 1V4 (519) 621-7510	AM	960
Chatham	CFCO Box 630 N7M 5K9 (519) 352-3000	AM	630
Cobourg	CHUC Box 520 K9A 4L3 (416) 372-5401	AM	1450
	CFMX-FM Box 1031 Port Hope L1A 4B5 (416) 372-2166	FM	103.1
Collingwood	CKCB 84 Hurontario St. L9Y 2L8 (705) 445-2011	AM	1400

Cornwall	CFLG Box 969 K6H 5V1 (613) 932-5180	FM	104.5
	CJSS Box 969 K6H 5V1 (613) 932-5180	AM	1220
Dryden	CKDR Box 580 P8N 2Z3	AM	800
Elliot Lake	CKNR 15 Charles Walk P5A 2A2 (705) 848-3608	AM	1340
Espanola	CKNS Box 1910 P0P 1C0 (705) 869-4930	AM	930
Fort Frances	CFOB Box 800 P9A 3N1 (807) 274-5341	AM	640
Guelph	CJOY Box 217 N1H 6K3 (519) 824-7000	AM	1460
	CKLA Box 217 N1H 6K3 (519) 824-7000	FM	106.1

Hamilton	CHAM 2 King St. W. L8P 1A1 (416) 526-1280	AM	820
	CHML 848 Main St. E. L8M 1M1 (416) 549-2411	AM	900
	CKOC Box 1150 L8N 3P5 (416) 545-5885	AM	1150
	CKDS 11 Springer Ave. L8M 2W7 (416) 549-2453	FM	95.3
Hawkesbury	CHPR 151 Principale est. Ste. 37 K6A 1A1 (613) 632-1110	AM	1150
Hearst	CFLH see Timmins CFCL (French)	AM	1340
Huntsville	CFBK Box 630 P0A 1K0 (705) 789-4461	AM	630
Kapuskasing	CFLK see Timmins CFCL (French)	AM	1230

	CKAP 24 Byng Ave. P5N 1X5 (705) 335-2379	AM	580
Kenora	CJRL Box 2490 P9N 3X8 (807) 468-3181	AM	1220
Kingston	CBBK see Toronto CBL	FM	92.9
	CFLY-FM Box 1380 K7L 4Y5 (613) 544-1380	FM	98.3
	CFMK 170 Queen St. K7K 1B2 (613) 544-2340	FM	96.3
	CFRC Carruther's Hall Queen's University K7L 3N6 (613) 547-6677	AM	1490
	CFRC Carruther's Hall Queen's University K7L 3N6 (613) 547-6677	FM	91.9

	CKLC Box 1380 K7L 4Y5 (613) 544-1380	AM	1380
	CKWS 479 Counter St. K7M 7J3 (613) 549-1911	AM	960
Kirkland Lake	CJKL Box 430 P2N 3J4 (705) 567-3366	AM	560
Kitchener	CFCA 864 King St. W. N2G 4E9 (519) 576-1053	FM	105.3
	CHYM Box 936 N2G 4E4 (519) 743-2611	AM	570
	CKGL Box 936 N2G 4E4 (519) 743-2611	FM	96.7
	CKKW 864 King St. W. N2G 4E9 (519) 579-1090	AM	1090
	CKWR Box 2035, Stn.B N2H 6K8 (519) 579-1150	FM	98.7

Leamington	CHYR 100 Talbot St. E. N8H 1L3 (519) 326-6171	AM	710
Lindsay	CKLY 249 Kent St. W. K9V 2Z3 (705) 324-9103	AM	910
London	CBBL See Toronto CBL-FM	FM	100.5
	CFPL Box 2580 N6A 4H3 (519) 438-8391	AM	980
	CFPL Box 2580 N6A 4H3 (519) 433-3696	FM	95.9
	CIXX 1460 Oxford St. E. N5V 1W2 (519) 453-2810	FM	106.9
	CJBK Box 1290 Stn. A N6A 5A2 (519) 686-2525	AM	1290
	CJBX Box 5593, Stn. A N6A 5H8 (519) 685-9393	FM	92.7

	CKO 380 Ridout St. N. N6A 2P4 (519) 433-8151	FM	97.5
	CKSL Box 1410 N6A 5J2 (519) 667-1410	AM	1410
Longlac	CHAP Community Centre Indian Reserve No. 40 Box 609 P0T 2A0 (807) 876-2685	AM	1450
Marathon	CFNO Box 1000 P0T 2E0 (807) 229-1010	FM	93.1
Midland	CKMP 490 DominionAve. L4R 1P6 (705) 526-2268	AM	1230
Mississauga	CJMR Box 1190 Port Credit Postal Station L5G 4M3 (416) 279-1190	AM	1190
Moosonee	CHMO Box 400 P0L 1Y0 (705) 336-2953	AM	1450

New Liskeard	CJTT Box 1058 P0J 1P0 (705) 647-7334	AM	1230
Newmarket	CKAN 138 Davis Dr. L3Y 2N1 (416) 898-1100	AM	1480
Niagara Falls	CJRN Box 710 L2E 6X7 (416) 356-6710	AM	710
North Bay	CFCH Box 3000 P1B 8K8 (705) 474-2000	AM	600
	CHUR Box 1110 P1B 8K4 (705) 472-1110	AM	840
	CKAT Box 3000 P1B 8K8 (705) 474-3693	FM	101.9
Oakville/ Burlington	CHWO 490 Wyecroft Rd. L6K 2H1 (416) 845-2821	AM	1250

Orillia	CFOR Box 550 L3V 6K2 (705) 326-3511	AM	1570
Oshawa/ Durham	CKAR 360 King St. W. L1J 2K2 (416) 571-1350	AM	1350
	CKQT 360 King St. W. L1J 2K2 (416) 571-1350	FM	94.9
Ottawa	CBO Box 3220 Station C K1Y 1E4 (613) 724-1200	AM	920
	CBO Box 3220 Stn. C K1Y 1E4 (613) 724-1200	FM	103.3
	CBOF C.P. 3220, Succ.C K1Y 1E4 (613) 724-1200 (French)	FM	102.5

CFGO 1575 Carling Ave. K1Z 7M3 (613) 725-1440	AM	1220
CFMO 150 Isabella St. K1S 5A3 (613) 233-6731	FM	93.9
CFRA 150 Isabella St. K1S 5A3 (613) 233-6241	AM	580
CHEZ 126 York St. Suite 509 K1N 5T5 (613) 563-1919	FM	106.1
CJSB 1504 Merivale Rd. K2E 6Z5 (613) 226-5450	AM	540
CKBY Ste. 1900, Twr.B Place de Ville 112 Kent St. K1P 6J1 (613) 238-6862	FM	105.3
CKCU Room 517, Unicentre Carleton University K1S 5B6 (613) 231-4498	FM	93.1

	CKO 150 Wellington St. K1P 5A4 (613) 238-2556	FM	106.9
	CKOY Suite 1900, Twr. B Place de Ville 112 Kent St. K1P 6J1 (613) 238-7482	AM	1310
Owen Sound	CFOS Box 280 N4K 5P5 (519) 376-2030	AM	560
Parry Sound	CFBQ 24-A William St. P2A 1V1 (705) 746-2163	AM	1340
Pembroke	CHRO Box 1010 K8A 7T3 (613) 735-1036	AM	1350
Peterborough	CFMP Box 928 K9J 7A5 (705) 748-6101	FM	101.5
	CHEX Box 928 K9J 7A5 (705) 742-7708	AM	980
	CKPT Box 177 K9J 6Y8 (705) 742-8844	AM	1420

	CKQM Box 177 K9J 6Y8 (705) 742-8844	FM	105.1
Port Elgin	CFPS See Owen Sound CFOS	AM	1490
Port Hope	CFMX Box 1031 L1A 4B5 (416) 372-2166	FM	103.1
Red Lake	CKRE See Dryden CKDR	AM	1340
Renfrew	CKOB Box 96 K7V 4A2 (613) 432-6428	AM	1400
Richmond Hill	CFGM 10254 Yonge St. L4C 3B7 (416) 961-1320	AM	1320
St. Catharines	CHOW Regional Road 23 Welland L8B 3N5 (416) 732-4433	AM	1470
	CHRE Box 1220 L2R 7A7 (416) 682-6691	FM	105.7

	CHSC Box 3020 L2R 7C7 (416) 682-6691	AM	1220
	CJQR Box 610 L2R 6X7 (416) 684-1174	FM	97.7
	CKTB Box 610 L2R 6X7 (416) 684-1174	AM	610
St. Thomas	CHLO Box 160 N5P 3T8 (519) 631-3910	AM	1570
Sarnia	CHOK Box 1070 N7T 7K5 (519) 336-1070	AM	1070
	CJFI 546 N. Christina St. N7T 5W6 (519) 336-1110	FM	99.9
Sault Ste. Marie	CFYN Box 1050 P6A 5N5 (705) 942-1050	AM	1050
	CHAS 426 Bruce St. P6A 5N5 (705) 942-1050	FM	100.5

	CJQM 111 Elgin St. Suite 201 P6A 6L6 (705) 759-9200	FM	104.3
	CKCY 111 Elgin St. Suite 201 P6A 6L6 (705) 759-9200	AM	920
Simcoe	CHNR Box 1600 N3Y 4K8 (519) 426-7700	AM	1600
Smiths Falls	CJET Box 630 K7A 4T4 (613) 283-4630	AM	630
	CHEQ Box 1200 K7A 5B4 (613) 283-4630	FM	101.1
Stratford	CJCS Box 904 N5A 6W3 (519) 271-2450	AM	1240
Sudbury	CBCS 15 Mackenzie St. P3C 2A9 (705) 675-2451	FM	99.9

	CBON 15 Mackenzie St. P3C 2A9 (705) 675-2451 (French)	FM	98.1
	CFBR Box 700, Stn. B P3E 4R9 (705) 674-6401 (French	AM	900
	CNHO Box 700, Stn. B P3E 4R9 (705) 674-6401	AM	550
	CIGM 336 Pine Street P3C 5N2 (705) 674-0711	FM	92.7
	CJMX-FM Box 700, Stn. B P3E 4R9 (705) 674-6401	FM	105.3
	CKSO 336 Pine Street P3C 5N2 (705) 674-0711	AM	790
Thunder Bay	CBQ 213 Miles St. E. P7C 1J5 (807) 622-5811	AM	800

	CJLB Box 3448, Stn. P P7B 5J9 (807) 345-5000	AM	1230
	CJSD 87 N. Hill St. P7A 5V6 (807) 344-3526	FM	94.3
	CKPR 87 N. Hill St. P7A 5V6 (807) 344-3526	AM	580
Tillsonburg	CKOT Box 10 N4G 4H3 (519) 842-4281	AM	1510
	CKOT Box 10 N4G 4H3 (519) 842-4281	FM	101.3
Timmins	CFCL Box 620 P4N 7G3 (705) 264-4211 (French)	AM	620
	CFTI Box 1046 P4N 7H8 (705) 264-1316	FM	92.1
	CKGB Box 1046 P4N 7H8 (705) 264-2351	AM	750

Toronto	CBL Box 500 Terminal A M5W 1E6 (416) 925-3311	AM	740
	CBL Box 500 Terminal A M5W 1E6 (416) 925-3311	FM	94.1
	CFRB 2 St. Clair Ave. W M4V 1L6 (416) 924-5711	AM	1010
	CFRX 2 St. Clair Ave. W. M4V 1L6 (416) 924-5711	Short Wave	6070
	CFTR 25 Adelaide St. E. 11th Floor M5C 1H3 (416) 864-2000	AM	680
	CHFI 25 Adelaide St. E. 12th Floor M5C 1H3 (416) 864-2070	FM	98.1
	CHIN 637 College St. M6G 1B6 (416) 531-9991	AM	1540

CHIN 637 College St. M6G 1B6 (416) 531-9991	FM	100.7
CHUM 1331 Yonge St. M4T 1Y1 (416) 925-6666	AM	1050
CHUM 1331 Yonge St. M4T 1Y1 (416) 925-6666	FM	104.5
CILQ 2 Bloor St. E. Ste. 3000 M4W 1A8 (416) 967-3445	FM	107.1
CJBC Box 500, Stn. A M5W 1E6 (416) 925-3311 (French)	AM	860
CJCL 464 Yonge St., Ste. 202 M4Y 1W9 (416) 923-0921	AM	1430
CJRT 297 Victoria St. M5B 1W1 (416) 595-0404	FM	91.1

	CKEY 1 Yonge St. M5E 1G1 (416) 361-1281	AM	590
	CKFM 24 St. Clair Ave. W. M4V 1L4 (416) 922-9999	FM	99.9
	CKLN 380 Victoria St. M5B 1W7 (416) 595-1477	FM	88.1
	CKO 30 Carlton St. M5B 2E9 (416) 591-1222	FM	99.1
Trenton	CJTN Box 9 K8V 5R1 (613) 392-1237	AM	1270
Wawa	CJWA Box 1220 POS 1KO (705) 856-2327	AM	1240
Welland	CHOW Regional Rd. 23 L3B 3N5 (416) 732-4433	AM	1470

Windsor	CBE 267 Pelissier St. 9th Floor N9A 4K5 (519)255-3411	AM	1550
	CBE 267 Pelissier St. 9th Floor N9A 4K5 (519)255-3411	FM	89.9
	CBEF 267 Pelissier St. 9th Floor N9A 4K5 (519) 255-3411 (French)	AM	540
	CJOM 300 Cabana Rd. E. N9G 1A3 (519) 966-7000	FM	88.7
	CKEZ Box 480 N9A 6M6 (519) 258-9300	FM	93.9
	CKLW Box 480 N9A 6M6 (519) 258-8888	AM	800
	CKWW 300 Cabana Rd. E. N9G 1A3 (519) 966-7000	AM	580

Wingham	CKNX 215 Carling Terrace NOG 2W0 (519) 357-1310	AM	920
	CKNX 215 Carling Terrace NOG 2W0 (519) 357-1310	FM	101.7
Woodstock	CKDK Box 100 N4S 7W7 (519) 539-7451	AM	1340

APPENDIX II

TELEVISION STATIONS
ONTARIO

APPENDIX II
TELEVISION STATIONS
ONTARIO

LOCALITY	TELEVISION STATION	CHANNEL (off-air)	NETWORK/ INDEPENDENT
Barrie	CKVR-TV Box 519 L4M 4T9 (705) 726-9711	3	*CBC A
Hamilton	CHCH-TV 163 Jackson St. W. L8N 3A6 (416) 522-1101	11	Ind.
Keewatin	CJBN-TV Box 1810 Kenora PNY 3X8 (807) 547-2852	13	CTV A
Kingston	CKWS-TV 170 Queen St. K7K 1B2 (613) 544-2340	11	CBC A
Kitchener	CKCO-TV 864 King St. W. N2G 4E9 (519) 578-1313	13	CTV A

*CBC A refers to CBC affiliates and CTV A refers to affiliates of CTV; CBC O & O refers to a station owned and operated by CBC.

London	CFPL-TV Box 2880 Terminal A N6A 4H9 (519) 686-8810	10	CBC A
North Bay	CHNB-TV (see CKNY-TV)	4	CBC A
	CKNY-TV Box 3220 P1B 8K3 (705) 476-3111	6	CTV
Ottawa	CBOFT (French) CP 3220, Succ C K1Y 1E4 (613) 724-1220	9	CBCO&O Societe Radio Canada
	CBOT Box 3220, Stn.C K1Y 1E4 (613) 724-1200	4	CBC O & O
	CHRO-TV 200 Isabella St. K1S 1V7 (613) 236-2476	5	CBC A
	CIII-TV 150 Wellington St. K1P 5A4 (613) 237-2022	22	Global

	CJOH-TV Box 5813, Stn. F K2C 3G6 (613) 224-1313	13	CTV A
Pembroke	CHRO-TV Box 1010 K8A 7T3 (613) 735-1036	5	CBC A
Peterborough	CHEX-TV Box 928 K9J 7A5 (705) 742-0451	12	CBC A
Sault Ste. Marie	CJIC-TV Box 370 P6A 5M2 (705) 254-7111	5	CBC A
	CKCY-TV Box 370 P6A 5M2 (705) 254-7111	2	CTV A
Sudbury	CICI-TV 699 Frood Rd. P3C 5A3 (705) 674-8301	5	CTV A
	CKNC-TV 699 Frood Rd. P3C 5A3 (705) 674-8301	9	CBC A
Thunder Bay	CKPR-TV 87 Hill St. N. P7A 5V6 (807) 344-9685	2	CBC A

	CHFD-TV 87 Hill St. N. P7A 5V6 (807) 344-9685	4	CTV A
Timmins	CFCL-TV Box 620 P4N 7G3 (705) 264-4211	6	CBC A
	CITO-TV2 Box 1145 P4N 7H6 (705) 264-1440	3	CTV A
Toronto	CBLFT (French) Box 500 Station A M5W 1E6 (416) 925-3311	25	CBC O Societe Radio-Canada CBC &
	CBLT Box 500, Stn.A. M5W 1E6 (416) 925-3211	5	CBC O & O
	CFMT-TV (Multi-lingual) 545 Lakeshore Blvd. W. M5W 1A3 (416) 593-4747	47	Ind.
	CFTO-TV Box 9, Stn.O M4A 2M9 (416) 299-2000	9	CTV A

	CICA-TV Box 200, Stn. Q M4T 2T1 (416) 484-2600	19	TVO
	CIII-TV 81 Barber Greene Rd. Don Mills M3C 2A3 (416) 446-5311	22	Global
	CITY-TV 99 Queen St. E. M5C 2M1 (416) 367-5757	57	Ind.
Windsor	CBEFT (French) Box 1609 N9A 1K7 (519) 255-3411	54	Societe Radio-Canada (CBC O & O)
	CBET Box 1609 N9A 1K7 (519) 255-3411	9	CBC O & O
Wingham	CKNX 215 Carling Terrace N09 2W0 (519) 357-1310	8	CBC A

APPENDIX III
CABLE TELEVISION COMPANIES
ONTARIO

APPENDIX III

CABLE TELEVISION COMPANIES
ONTARIO

LOCALITY	CABLE COMPANY	AREA SERVED	TELEPHONE
Ajax	Maclean Hunter Cable	Ajax	(416)683-1751
Alliston	Trillium Cable, Barrie		(705)728-3644
Arnprior	Arnprior Cablevision	Arnprior	(613)623-6541
Atikokan	Norwont	Atikokan	(807)597-6050
Aurora	Aurora Cable TV	Aurora, Oak Ridges	(416)727-1981
Aylmer	East Elgin Cable TV	Aylmer, Orwell	(519)773-3162
Bancroft	Trillium Cable, Orillia		(705)325-1376
Barrie	Trillium Cable Communications	Barrie, Midhurst, Stroud, Alcona Alliston, Angus, Everette, CFB Borden	(705)728-3644
Barry's Bay	Trillium Cable, Orillia		(705)325-1376
Bay Ridges	Pickering Cable TV		(416)683-9800
Beardmore	Astrocom Cablevision		(807)854-1569

Belleville	Cablevue (Quinte)	Belleville, Trenton, Chatterton, Pointe Anne, Oak Lake, Stirling Wallbridge	(613)966-3226
Blind River	Northshore Cable Services	Blind River	(705)848-3688
Blyth	Mitchell - Seaforth Cable TV		(519)345-2341
Bolton	Albion Cable TV	Bolton	(416)857-1802
Bracebridge	Gravenhurst Cable System		(705)687-3765
Brampton	Maclean Hunter-Cable TV (Toronto)		(416)675-5930
Brampton	Rogers Cable TV	Brampton Parts of Caledon	(416)456-2280
Brantford	Rogers Cable TV	Brantford, Paris, Mt. Pleasant St. George	(519)759-3020
Brockville	Brockville Cable	Brockville Prescott, Lyn Maitland	(613)342-2640
Burlington	Burlington/Oakville Cablenet	Burlington Oakville	(416)844-2230
Campbellford	Redden's Cable TV	Campbellford	(705)653-4491

Cardiff	Cardiff Cable	Cardiff	(613)339-2721
Carlton Place	Ottawa Cablevision		(613)722-1111
Chapleau	Superior TV System	Chapleau	(705)864-1462
Chatham	Chatham Cable TV	Chatham and area	(519)352-8270
Chesley	Saugeen Telecable		(519)364-2131
Cobalt	Clear Crest Cable TV		(705)647-8151
Cobourg	Northumberland Cable TV	Cobourg Creighton Heights, Precious Corners Dale, Baltimore Port Hope, Welcome Telephone Rd. Trailer Parks	(416)372-2274
Cochrane	Cochrane Cable TV	Cochrane	(705)272-5290
Collingwood	Maclean Hunter Cable TV	Collingwood Nottawa, Stayner	(705)445-3400
Cornwall	Rogers Cable TV	Cornwall Rosedale Terrace Glendale	(613)932-6451
Deep River	Deep River Video	Deep River	(613)584-4488
Dorchester	Anthony's Mobile Home Park	Dorchester	(519)268-3131

Dryden	Dryden Community TV	Dryden, Anton's Rd. Mud Lake	(807)223-5525
Dundas	Western Co-Axial		(416)522-3012
Durham	Saugeen Telecable		(519)364-2131
Ear Falls	General Cable Vision		(807)547-2853
Elliot Lake	Northshore Cable Services	Elliot Lake	(705)848-3688
Erin	Orangeville Cable-Vu		(519)941-4030
Espanola	Northshore Cable Services	Espanola, McKerrow, Webbwood	(705)869-1600
Exeter	Ex-Cen Cablevision	Exeter, Centralia, Huron Park	(519)482-9233
Fergus	Fergus-Elora Cable TV	Fergus, Elora, Salem	(519)843-1890
Fort Frances	Norwont	Fort Frances	(807)274-5522
Gananoque	Kingston Cablenet		(613)544-6311
Georgetown	Halton Cable Systems	Georgetown, Milton, Acton, Norval, Glen Williams, Rockwood	(519)853-1270
Geraldton	Astrocom Cablevision	Geraldton, Longlac, Beardmore	(807)854-1569

Goderich	Bluewater TV Cable	Goderich, Saltford Holmesville, Clinton, Meneset Park, Vanastra	(519)482-9233
Gore Bay	Gore Bay Community TV	Gore Bay	(705)282-2091
Gravenhurst	Gravenhurst Cable System	Bracebridge Gravenhurst	(705)687-3765
Grimsby	Grimsby Cable TV	Grimsby	(416)945-4932
Guelph	Maclean Hunter Cable TV	Guelph	(519)824-2030
Haileybury	Clear Crest Cable TV		(705)647-8151
Haliburton	Haliburton C.A.T.V.	Haliburton Minden	(705)457-1040
Hamilton	Maclean Hunter Cable TV	S.W. Hamilton	(416)522-0123
Hamilton	Mountain Cablevision	Parts of Hamilton Mountain, Glendale, Roxborough Park	(416)389-1347
Hamilton	Niagara Co - Axial	Part of Hamilton Stoney Creek	(416)662-8672
Hamilton	Northgate Cable TV	Hamilton North Stoney Creek	(416)522-1400
Hamilton	Rogers Cable TV	Hamilton East	(416)547-2376

Hamilton	Southmont Tel-E-Vents	S. Hamilton Glanbrook	(416)389-9219
Hamilton	Western Co-Axial	Hamilton W., Ancaster, Part of Dundas, Greensville	
Hanover	Saugeen Telecable	Hanover, Walkerton, Chesley, Durham	(519)364-2131
Hawkesbury	Cie Cablevision de Hawkesbury Ltee	Hawkesbury Carillon Gardens	(613)632-2514
Hearst	Hearst Cable Services	Hearst	(705)362-4201
Hornepayne	TV Hornepaye	Hornepayne	(705)362-5792
Horseshoe Valley		Horseshoe Valley Resort	(705)835-2014
Huntsville	Maclean Hunter Cable TV	Huntsville	(705)789-2731
Ignace	General Cable Vision		(807)547-2853
Iroquois Falls	Iroquois Falls Cable TV	Iroquois Falls	(705)272-6886
Kapuskasing	Kapuskasing Cable TV	Kapuskasing, Val Rita	(705)335-8595
Kemptville	Smiths Falls Cablevision		(613)283-6150
Keewatin	Kenora Cable Vision	Kenora, Keewatin Rabbit Lake	(807)547-2853

Keswick	LSC Systems		(416)722-3257
Kincardine	Kincardine Cable TV	Kincardine	(519)396-7802
Kingston	Kingston Cablenet	Greater Kingston Area	(613)544-6311
Kirkland Lake	Fred Lang TV	Kirkland Lake	(705)567-9383
Kitchener	Rogers Cable TV	Kitchener, Waterloo, Cambridge, Stratford, and Areas	(519)893-2101
Lakefield	Trillium Cable, Orillia		(705)325-1376
Leamington	Leamington Cable TV	Leamington Kingsville and areas	(519)326-4423
Lindsay	Lindsay CATV System	Lindsay and area	(705)324-4141
Listowel	Country Cable	Listowel Mt. Forest, Harriston, Arthur, Palmerston	(519)291-3551
London	Maclean Hunter Cable TV	S. London, Lambeth	(519)433-0141
London	Rogers Cable TV	N. London Thamesford, Arva, Dorchester	(519)672-7700
Longlac	Astrocom Cablevision		(807)854-1569

Lucknow	Kincardine Cable TV		(519)396-7802
Madoc	Hastings Cable Vision	Madoc	(613)473-2839
Manitouwadge	Lakeshore Comm. TV		(705)825-3305
Marathon	Lakeshore Comm. TV		(705)825-3305
Malton	Maclean Hunter Cable TV, Toronto		(416)675-5930
Mattice	Mattice TV System	Mattice	(705)362-5792
Midland	Maclean Hunter Cable TV	Midland Penetanguishene	(705)526-5031
Millbrook	Trillium Cable		(705)325-1376
Minden	Haliburton C.A.T.V.		(705)457-1040
Mississauga	Maclean Hunter Cable TV, Toronto		(416)675-5930
Mississauga	Rogers Cable TV	Mississauga Erin Mills	(416)270-2424
Mitchell	Mitchell-Seaforth Cable TV Edmondville Harpurhay	Mitchell Seaforth, Dublin	(519)345-2341
Nanticoke	Lindsay CATV System		(705)324-4141
Napanee	Napanee-Deseronto Cablevision	Napanee, Deseronto	(613)354-2377
New Liskeard/ Haileybury	Clear Crest Cable TV	New Liskeard Haileybury Cobalt	(705)647-8151

Newmarket	Rogers Cable TV	Newmarket, Bradford	(416)895-5169
Niagara Falls	Armstrong Comunic.		(416)735-3331
North Bay/ Callander	Maclean Hunter Cable TV	North Bay Callander	(705)472-6580
Norwich	Nor-Del Cablevision	Delhi, Otterville, Norwich	(519)863-3116
Oakville	Burlington/Oakville Cablenet	Oakville, Burlington	(416)844-2230
Orangeville	Orangeville Cable-Vu	Orangeville Parts of Mono	(519)941-4030
Orillia	Trillium Cable Communications	Orillia, Bancroft Atherley, Marchmount	(705)325-1376
Oshawa	Rogers Cable TV	Oshawa, Whitby Bowmanville, Orono	(416)579-2232
Ottawa	Ottawa Cablevision	West Ottawa Carleton Place Kanata, Napean	(613)722-1111
Ottawa	Skyline Cablevision	East Ottawa, Vanier, Napean, Rideau	(613)731-8250
Owen Sound	Maclean Hunter Cable TV	Owen Sound, Meaford	(519)376-5195
Oxford Mills	Smith Falls Cablevision		(613)283-6150

Paisley	Southport Cable TV		(519)832-6297
Parkdale	Maclean Hunter Cable TV	Parkdale, Trinity	(416)534-2948
Parry Sound	Radio & TV Distribution	Parry Sound	(705)746-2659
Pefferlaw	LSC Cable Systems	Pefferlaw, Keswick, Sutton, Beaverton	(416)722-3257
Pembroke	Pembroke Cablevision	Pembroke, Petawawa	(613)735-6819
Peterborough	Maclean Hunter Cable TV	Peterborough	(705)742-9264
Pickering	Pickering Cable TV	Pickering, W.Rouge, Seaton	(416)683-9800
Picton	Quinte Cablevision	Picton, Picton Heights	(613)476-2722
Port Elgin	Southport Cable TV	Port Elgin, Paisley Southhampton	(519)832-6297
Port Elmsley	Smith's Falls Cablevision		(613)283-6150
Port Perry	Compton Cable TV	Port Perry, Uxbridge, Prince Albert, Manchester Utica	(416)985-8171

Red Lake	General Cablevision	Red Lake, Ear Falls, Sioux Lookout, Ignace	(807)547-2853
Red Rock	Lakeshore Community TV		(705)825-3305
Renfrew	Renfrew Cablevision	Renfrew	(613)432-4811
Richmond Hill	Classic Communications	Richmond Hill Vaughan, Markham, Thornhill, Woodbridge	(416)884-8111
Rockland	Laurentian Cable TV	Rockland	(613)446-4612
St.Catharines	Mclean Hunter Cable TV	St.Catharines, Thorold	(416)688-2555
St. Mary's	St. Mary's TV Cable Service	St. Mary's	(519)284-1921
St. Thomas	Allview Cable Service	St. Thomas Port Stanley, Union	(519)631-5060
Sarnia	Mclean Hunter Cable TV	Sarnia, Port Edward Brights Grove	(519)337-3703 Port Edward,
Sault Ste. Marie	Lake Superior Cable	Sault Ste. Marie	(705)949-3901

Schreiber	Sisson's Cable TV	Schreiber	(807)824-2618
	Clearview Cable TV	Simcoe	(519)426-7360
Sioux Lookout	General Cable Vision		(807)547-2853
Smooth Rock Falls	Smooth Rock Falls Cable TV	Smooth Rock Falls	(705)335-8595
Stoney Creek	Niagara Co-Axial		(416)662-8672
Strathroy	Airland Communications Services	Strathroy	(519)482-9233
Sturgeon Falls	Northshore Cable Services	Sturgeon Falls, Cache Bay	(705)753-1500
Sudbury	Sudbury Cable Services	Sudbury	(705)560-1560
Swastika	Fred Lang TV	Swastika	(705)567-9383
Terrace Bay	Lakeshore Community TV	Terrace Bay Red Rock, Nipigon, White River	(705)825-3305
Thunder Bay	Maclean Hunter TV	Thunder Bay	(807)345-1211
Tillsonburg	Till Cable TV	Tillsonburg	(519)842-5242
Timmins	Timmins Cable Services	Timmins, Schumacher	(705)267-6434
Toronto	Graham Cable TV/FM	Parts of Toronto and York	(416)762-3622

Toronto	Maclean Hunter Cable TV	Etobicoke, Mississauga	(416)675-5930
Toronto	Newton Cable Communications	Part of Metro. Toronto	(416)661-9252
Toronto	Rogers Cable TV	Toronto, East and North York	(416)446-6500
Toronto	Scarboro Cable Communications	Scarborough	(416)439-9930
Tweed	Village Cables Systems	Tweed	(613)478-5766
Uxbridge	Compton Cable TV		(416)985-8171
Wawa	Lakeshore Community TV	Wawa	(705)856-2108
Welland	Armstrong Communications	Welland, Niagara Falls, Chippawa	(416)735-3331
White River	Lakeshore Comm. TV		(705)825-3305
Whitney	Trillium Cable Orillia		(705)325-1376
Wiarton	Wiarton Cable TV	Wiarton	(519)832-6297
Windsor	Windsor Cable Communications	Windsor	(519)258-6334
Wingham	Country Cable	Wingham	(519)291-3551
Woodstock	Western Cable TV	Woodstock Ingersoll	(519)539-8101

APPENDIX IV

INDEPENDENT TELEPHONE COMPANIES
ONTARIO

APPENDIX IV

INDEPENDENT TELEPHONE COMPANIES
ONTARIO

NAME/ADDRESS OF SYSTEM	EXCHANGES	TOTAL COMPANY TELEPHONES
Abitibi-Price Inc. Iroquois Falls P0K 1E0	Iroquois Falls	1,303
Amtelecom Inc. 18 Sydenham St. Aylmer N5H 1L2	Aylmer Cambray Dyer's Bay Lion's Head Port Burwell Stokes Bay Straffordville Tobermory	12,142
Blanshard Municipal Telephone System Kirkton, Ontario N0K 1K0	Granton Kirkton Sebringville Uniondale	4,838
Brooke Municipal Telephone System P.O. Box 40 Inwood, Ontario N0N 1K0	Alvinston Inwood Watford	1,927

Cochrane Public Utilities Commission 153 Sixth Avene P.O. Box 640 Cochrane P0L 1C0	Cochrane	3,472
Coldwater Municipal Telephone System P.O. Box 202 Coldwater L0K 1E0	Coldwater	1,191
Dryden Municipal Telephone System 30 Van Horne Ave. Dryden P8N 2A7	Dryden	6,036
Durham Telephones Ltd. 63 Brule Gardens Toronto, Ontario M6S 4J5	Caven Millbrook	1,822
Gosfield North Municipal Telephone System P.O. Box 130 Cottam N0R 1B0	Cottam	1,631
Hay Municipal Telephone System P.O. Box 99 Zurich, Ontario N0M 2T0	Dashwood Grand Bend Zurich	4,539

Huron and Kinloss Municipal Telephone System P.O. Box 220 Ripley N0G 2R0	Dungannon Ripley	3,530
Hurontario Telephones Ltd. P.O. Box 59 Thedford N0M 2N0	Port Franks Thedford	2,200
Keewatin Municipal Telephone System P.O. Box 139 Keewatin, Ontario P0X 1C0	Keewatin	1,350
Kenora Municipal Telephone System P.O. Box 1110 Kenora P9N 3X7	Kenora	9,417
Lansdowne Rural Telephone Co. Ltd. P.O. Box 9 Lansdowne K0E 1L0	Lansdowne	1,925
Manitoulin Island Telephone Co. Ltd. 18 Sydenham St. E. Aylmer N5H 1L2	Manitowaning Mindemoya	2,375

Mornington Municipal Telephone System 16 Mill St. Milverton N0K 1M0	Milverton	2,305
North Frontenac Telephone Co. Ltd. P.O. Box 130 Baden N0B 1G0	Parham Sharbot Lake	1,465
North Norwich Municipal Telephone System P.O.Box 33 Burgessville N0J 1C0	Burgessville Norwich Woodstock	2,122
North Renfrew Telephone Co. Ltd. P.O. Box 70 Beachburg K0J 1C0	Beachburg Pembroke Westmeath	1,575
Northern Telephone Ltd. 17 Paget St., Box H New Liskeard P0J 1P0	Abitibi Canyon, Calstock, Cobalt, Cochrane, Connaught, Detour Lake, Earlton, Elk Lake, Englehart, Farquier, Gowganda, Haileybury, Hearst, Iroquois Falls, Kamiskotia, Kapuskasing Kirkland Lake, Larder Lake, Latchford,	77,600

	Matachewan, Matheson, Mattice, Moonbeam, New Liskeard, Opasatika, Opishing, Ramore, Smooth Rock Falls, South Porcupine, Swastika, Timmins Virginiatown	
Otonabee Telephones Ltd. 63 Brule Gdns. Toronto M6S 4J5	Keene	1,300
People's Telephone Company of Forest Ltd. P.O. Box 700 Forest N0N 1J0	Aberarder Arkona Forest	4,825
Roxborough Telephone Company Ltd. P.O. Box 179 Moose Creek K0C 1W0	Moose Creek	590
South Bruce Rural Telephone Co. Ltd. Teeswater N0G 2S0	Mildmay Teeswater	2,700

Thunder Bay Telecommunications 241 Vickers Street S. Thunder Bay P5E 1J5	Court St., Current River, MacKenzie, Murillo, Riverview, Rosslyn, Shuniah, Vickers Street	102,750
Tuckersmith Municipal Telephone System R.R. No. 1 Brucefield N0M 1J0	Bayfield, Clinton, Hensall, Seaforth	2,950
Westport Telephone Co. P.O. Box 252 Westport K0G 1X0	Westport	1,570
Wightman Telephone Ltd. P.O. Box 70 Clifford N0G 1M0	Ayton Clifford Gorrie Neustadt	3,600

APPENDIX V
GLOSSARY

APPENDIX V
GLOSSARY

ACCESS TIME:

The time it takes a computer to deliver information requested by a user.

ANALOG:

The representation of numerical quantities by means of physical variables such as voltage, current or resistance.

ASYNCHRONOUS TRANSMISSION:

Transmission whereby each information character is individually synchronized by the use of start and stop elements. The gap between characters is not necessarily of fixed length.

BAUD:

A measurement of communications speed between devices. A baud usually refers to bits transmitted per second. When divided by 10, a baud usually represents the number of characters transmitted per second.

BIT:

A contraction of binary digit. A bit is the smallest unit of information in a digital computer.

BYTE:

A group of adjacent bits that represent a single unit of information.

COAXIAL CABLE:

A transmission line consisting of two concentric tubular conductors separated by an insulator and capable of carrying many television or radio signals simultaneously.

COMMUNICATIONS COMMON CARRIER:

A company that dedicates its facilities to a public offering of communication services, subject to public utility – like regulation.

DIGITAL:

Discrete values of amplitude and duration representing binary code.

FIBRE OPTICS:

Technology enabling light waves to be carried through transmission lines made of thin glass fibres.

GEOSYNCHRONOUS ORBIT:

The orbit of a satellite in space at the same speed as the earth turns on its axis.

GIGABYTE:

A billion bytes. (Actually, 2 to the 36th power, which is 1,003,741,824 bytes).

GHz:

Gigahertz (1 Billion Hertz), refers to a measure of frequency in the spectrum.

INDEPENDENT TELEPHONE COMPANIES:

All those telephone companies operating in Ontario, except Bell Canada.

INTERFACE:

The connection between two devices, such as the computer and the keyboard, or the conventions for passing control and data between two programs.

K or KB:

An abbreviation for a kilobyte, which is 1,024 bytes. This is about half of a normal typewritten page, so 64K would be enough memory to store about 32 typed pages.

KHz:

An abbreviation for kilohertz, which is 1000 hertz.

LOCAL AREA NETWORK:

A communications system that allows a number of information processing devices to link up with each other for a limited distance, such as within a college campus or office building.

MB or M:

A megabyte, consisting of a million (actually 2 to the 20th power or 1,048,576) bytes.

MHz:

An abbreviation of megahertz, which is 1 million hertz.

MENU-DRIVEN:

Software that guides the microcomputer user by presenting a number of alternative functions from which to choose.

MICROWAVE:

Part of the spectrum above 500 MHz used for point-to-point communications. Geographic barriers act as obstacles to microwaves.

MODEM:

A contraction of modulator-demodulator, a device that translates computer data into pulses that can be transmitted over telephone lines or optical cables.

PRIVATE BRANCH EXCHANGE (PBX):

Telephone switching equipment that is used on a dedicated basis for interconnecting the stations located on a customer's premises with each other and the public dialed network.

PROTOCOL:

A set of rules that define how terminals will interact with the network.

REPEATER STATIONS:

Antennas which pick up and rebroadcast the signal from the base station transmitter.

SYNCHRONOUS TRANSMISSION:

Transmission whereby information is sent at regular intervals such that sending and receiving terminals are operating in step with each other.

TELETEXT:

The display of textual graphics information on a television set that has been adapted for the purpose.

TRANSPONDER:

That part of a communications satellite that receives and retransmits signals.

TRUNK:

The cable through which information is transmitted from one central office to another central office that acts as a main distribution point of a cable system.